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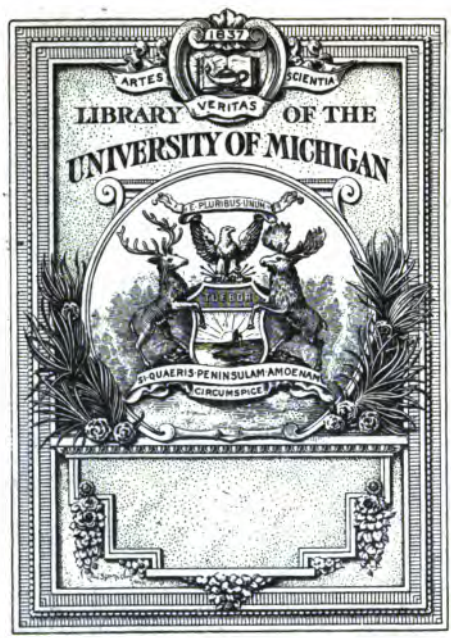

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TRANSACTIONS

OF THE

SOCIETY

FOR THE

Promotion of Useful Arts,

IN THE

STATE OF NEW-YORK.

VOLUME III.

ALBANY:

PRINTED BY WEBSTERS AND SKINNERS.

1814.

PREFACE.

THE *Society for the Promotion of Useful Arts* have thought it proper to denominate the present volume the third of their transactions—Their first was published under the title of *Transactions of the Society for the Promotion of Agriculture, Arts and Manufactures;* but the act of incorporation by that name having expired, a new one was obtained reviving its corporate powers under the present title. Several years have intervened between the appearance of this volume and the second —The Society hope in future to publish a half volume annually.

Most of the papers to be found in the following sheets were read before the Society at its two last sessions—many important essays communicat-

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ed since the last publication have been withdrawn by their authors—and the committee for printing regret that they have been unable to obtain them.

It will be unnecessary here to notice particularly the subjects to which the following papers allude; yet it may not be improper to mention that the first article in the appendix was inserted in order to shew the disposal of the premiums which have been liberally granted by the Legislature for the encouragement of the manufacture of woollen cloth in this state—exhibiting at one view the sums of money expended, and the honors conferred.

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ANNUAL ADDRESS,

DELIVERED

BY APPOINTMENT,

BEFORE

THE SOCIETY

FOR THE

PROMOTION OF USEFUL ARTS,

AT THE CAPITOL,

IN THE

CITY OF ALBANY,

ON THE 3d OF FEBRUARY, 1813.

BY THEODRIC ROMEYN BECK, M. D.

Fellow of the College of Physicians and Surgeons (New-York) and one of the Counsellors of the Society for the Promotion of Useful Arts.

[Printed 1813.]

PREFACE.

THE Address which is now presented to the public, is published as it was delivered, with a few alterations and additions, that subsequent information has enabled me to make.

In composing it, the aim proposed has been a specific one. It was to exhibit at one view the mineral riches of the United States, with their various application to the Arts, and to demonstrate the practicability of the increase of different manufactures, whose materials are derived from this source. On the policy of extensive manufactories in this country, I have not dared to touch. It is more properly the province of the politician. I may however observe, that those establishments which spring up spontaneously, without the aid of imposts and heavy duties on foreign materials, ought to be encouraged, and indeed must unavoidably flourish. It cannot however be the wish of any true patriot, that the United States should become, in the strict sense of the word, a manufacturing country. The disease, vice, and diversified forms of misery, that exist in those parts of England, from whence our hardware and cloths are obtained, are sufficient to make the most sanguine advocate for the encouragement of manufactures tremble. After all that has been written and said on the subject, together with the notice that our national legislature are giving to it, the wants of the country are the true data, which must guide to a decision on this subject.

It can hardly be supposed that in noticing a subject so extensive, as the mineral kingdom, some omissions should not be made. Information is with difficulty obtained, and particularly so where the subject is new, and has not excited general attention. The errors that must necessarily be observed, will, it is hoped, be pardoned. From those, who are best acquainted with the extent and nature of the theme, I have little to fear. They are fully capable of appreciating its difficulty.

If these pages should call the attention of any of its readers to the science of mineralogy, and cause them to lend their exertions to promote its usefulness, the highest wish of the Author will be gratified.

ANNUAL ADDRESS.

IT is of vast importance to a country, that knowledge be extensively diffused. Its utility is not confined to individuals, whose minds may be enlightened, and whose feelings may be improved; but is spread over every part of community. Taken in its most comprehensive sense, it may justly be asserted, that knowledge advances civilization, gives new energy to the mental powers, and places man in that proud and commanding station in the scale of animated being to which his destiny entitles him. The maxim that "*knowledge is power*," is daily elucidated in the affairs of life; and among the moral phœnomena that agitate the world, its effects are clearly perceptible. It resembles in this respect, the electric fluid, which during the calm and tranquil occurrences of nature, pervades and operates imperceptibly over space, but when collected in the heavens, and kindled into action, its effects are tremendous and overpowering. Like all other things, it may be abused. The advantage that its owner possesses, may be employed towards the demoralizing of society, or the destruction of the species. But to those who are unwilling, or incapable of appreciating its importance in so grand a point of view, it may be sufficient to

refer to the improvements daily produced in domestic comforts, and in the enjoyments of social life. "We are," says an elegant writer, "much happier for the discovery of "Barometers, Thermometers, Steam Engines, and all the "innumerable inventions in the arts and sciences. We are "every day, and every hour reaping the benefit of such in-"genuity."†

Addressing myself to a society, whose aim is the promotion of useful knowledge, whose first wish is its advancement in our native country, I cannot refrain from congratulating its members on the great and important improvements, that have been made in the Arts and Sciences, since its first organization.‡ During the last twenty years, the march of investigation has been unusually rapid, elucidating something in every branch of knowledge, and improving the systems of all. Although our country, from its peculiar situation, and the pursuits of its inhabitants, has contributed but little towards this happy result, yet its effects are not the less advantageous to our citizens. The want of fortune, and leisure, prevent in a great measure the severe study necessary for inventive pursuits, still however the application of discoveries to useful and œconomical purposes, has not been wanting in many interesting, and even in some splendid instances.

The progress of discovery, and invention has peculiarly adorned the age in which we live. Amidst bloodshed and tumult, Science rises proudly pre-eminent, and claims exemption from the common lot of mortality, as well by the magnitude, as the utility of her designs. In no department has such rapid improvement been made, as in that styled *mathematical and physical science. Chemistry* has totally changed its form. Instead of remaining a mass of barbarous names, and crude theories, it has become a science at once stupendous and beautiful, wonderful alike for the extensive research and minute accuracy that it combines.

† Edinburgh Review, vol. 15, p. 282. Amer. edit.

‡ "The Society for the Promotion of Agriculture, Arts and Manufactures," was organized in 1791; at the expiration of its charter in 1804, it was re-incorporated under its present name, "*The Society for the Promotion of Useful Arts.*"

Within a few years, a new agent has been introduced, whose powers imagination itself could hardly have calculated. "It "has developed the composition of substances, which the "profoundest research had regarded as simple," and certainly promises at no distant day to change the whole system of chemical philosophy. The progress of *natural philosophy* has been unusually rapid. The measurement of the surface of the earth, as well as of heights, has been effected with an accuracy before unknown. The recondite properties of light and heat have been examined, and the existence of new planets ascertained. Werner and Klaproth in Germany, Kirwan in Britain, and Haüy in France, have investigated *mineralogy* and *geology* with uncommon success, and their disciples in every quarter of Europe, are pursuing these sciences with an ardour remarkable even among men, whose predominant passion is the love of knowledge. *Natural history* has not been left without its votaries. To enlarge its boundaries, numerous voyages and travels have been undertaken, the earth has been circumnavigated, the deserts of Africa have been explored by Park, and the Andes ascended by Humboldt. Through these means, the science of *medicine* has also been improved, and remedies of important value have been added from the vegetable, and mineral kingdoms.

Those *Arts* which are styled *useful*, are immediately dependant on the above branches of information, and (as might be expected) have advanced with proportionate rapidity. Among the improvements may be mentioned, the invention of machinery, the discovery and application of chemical agents, and the developement of various processes which were formerly concealed from sordid or national views.

With such a flood of light pouring on us from the old world, it surely becomes the duty of every one who desires his country's prosperity, to direct it to the best advantage. Our resources must be investigated, and our ability to conduct useful undertakings ascertained. If the establishment of manufactories is intended, it becomes a subject of preliminary enquiry, whether the number of hands required can

be properly spared by the agricultural interest, whether the materials to be used can be obtained in sufficient quantity, and whether with all the advantage that our knowledge of European inventions affords, such manufactories will prove more advantageous to the nation at large, than the importation of similar articles from foreign countries. At present they are principally required for our domestic wants. The most important to us are those which are subservient to agriculture, and without which it cannot be carried on. There are others which as an independent nation we ought to disdain procuring from abroad. Indeed a large proportion of the raw materials used in those manufactories of which we are in most need, are derived from the mineral kingdom, and if they are to be found in this country of sufficient excellence, the necessity of importation will be done away. In this point of view, the *mineralogical resources of the United States* become a subject of great interest, and are highly deserving the attention of every friend of science and the arts. A brief sketch of their value, together with their application and use in manufactures and the arts, cannot fail of receiving the attention of this society.

It is only within a few years that *mineralogy* has received the notice that it deserves. It was not indeed until this science became united with geology that it could boast of very great names among its votaries.† The magic of theoretic investigation drew many to its standard, who before attended to more pleasing branches of natural history. Werner and Hutton promulgated different systems of the formation of the earth, both probably too much influenced by the appearances that nature presents in their respective countries. The adherents of each have been numerous and active, and their exertions unwearied to establish the correctness of the different theories. In consequence of the dependence of geology on mineralogy, the latter has of course rapidly

† The various systems of the formation of the earth advanced before this period, such as Whiston's, Buffon's, &c. were *wholly* the result of hypotheses, and are totally independent of any support from mineralogy.

progressed. New discoveries are daily made, the ardour of scientific pursuit has extended to various countries, and at present it may safely be said, that no branch of learning has more numerous or ingenious disciples. When it is also recollected that chemistry forms a constituent part of the investigation, its dignity as a subject of research stands completely established.

Such is the science which in Europe has received the patronage of monarchs, and the homage of genius. In this country it is also becoming a subject of enquiry. The United States present a vast field for examination. Extending over twenty degrees of latitude, and embracing almost every climate; while the face of the country presents the various alternations of mountain and valley, and exhibits at once every formation from the primitive to the volcanic,† it cannot be doubted that at no distant day, industry and enterprize will enrich them with most of the minerals that Europe produces. It is only necessary to attend to the history of those already discovered, to be further convinced of this result.

Iron claims the highest rank both from its value and frequent use. Its application to domestic purposes is so various, and the forms in which it is used so diversified, that it is hardly possible to conceive of communities in any degree civilized, without their possessing some knowledge of its properties. The most savage nations with whose history we are acquainted, appear totally ignorant of its importance.* The existence of iron in the present United States appears to have

† Several facts proving the existence of a volcanic tract in Louisiana, are mentioned in Brackenridge's account of the minerals of that country, vide American Med. and Philos. Register, vol. 2, p. 38. Dr. Mitchill also mentions the fact with additional proofs, in his lectures on natural history.

* The arms of the aborigines of North America were principally formed from siliceous stones; those of the Fegee Islanders appear to resemble them, vide Warden's analysis of their axe stones. Med. Repos. vol. 13, p. 75. "Man" says Dr. Robertson, "was long acquainted with the other metals, before he acquired the art of fabricating iron, or attained such ingenuity as to perfect an invention, to which he is indebted for those instruments wherewith he subdues the earth, and commands all its inhabitants." History of America, book 4th.

been known at a very early period to the colonists. In the year 1620, the company to whom the province of Virginia had been granted, sent out 150 persons to erect three iron works.† The success of this attempt is not stated. In 1645, permission to make iron, was granted by the legislature of Massachusetts, and in consequence works were erected in several towns.‡ Nearly a century afterwards (in 1731) there were in New-England 6 furnaces for hollow ware and 19 forges.* In 1715, pig and bar iron were first made in Virginia, and the flourishing state of the manufactories of this metal in the colonies may be inferred from the fact, of the British Parliament in 1719, enacting several restrictive clauses unfavorable to these works.¶ Since the revolution, new mines have been continually discovered, and in general worked to great advantage. At present there is scarcely a State, in which iron is not found. From actual enumeration it appears that in 1810, the furnaces, forges and bloomeries in the United States amounted to 530, of which this state furnished 69.§ If they have increased with the same rapidity in other states as they have in ours, their number at this time cannot be much short of six hundred. The value of the iron and its manufactories annually made in the United States, is estimated by Mr. Gallatin at from 12 to 15 millions of dollars,‖ whilst the imported metal, in its forms of bar-iron, steel, &c. is supposed to average near four millions. This statement is highly encouraging even if it be compared with the English iron trade. Abounding in mines of excellent ore, and in facilities for working them, it is still found that for seven years (from 1797 to 1803) England annually imported about

† Holmes' American Annals, vol. 1, p. 205.
‡ Ibid. - - vol. 1, p. 335.
* Ibid. - - vol. 2, p. 130.
¶ Oddy's European Commerce, vol. 2, p. 286.
§ Mitchell's view of the manufactures in the United States, in the American Med. and Philos. Register, vol. 2, p. 413.
‖ Gallatin's report on the state of American manufactures in 1810. The manufactures of iron in the state of Pennsylvania amounted in that year to the value of $5,869,487. (Mease's Picture of Philadelphia, p. 80.)

43,000 tons of iron.† The value indeed of her manufactories consist principally in labor. The exquisite state of workmanship to which the various forms of iron are brought, and the extent of her commerce, places it among the most productive branches of national industry. The metal which is used in Great Britain in the process of steel making, is procured from the district of Roslager in Sweden.‡ It is obtained from the ore, called *magnetic iron stone*, which is so pure as to yield from 80 to 90 per cent of iron. In due process of time, the nation which furnishes this rich material, is obliged to become a purchaser of the finished goods. These facts deserve the attention of the enterprising in this country. Sweden is much indebted for the high character, which her staple commodity holds in foreign markets, to the care that is bestowed in its preparation. The crown, as well as the proprietors of iron works, interest themselves in preserving its reputation.* A subject so intimately connected with domestic improvements, certainly deserves the fostering care of government.

The ores of iron which are found in this country, are for the most parts, *magnetic iron stone*, *brown hæmatite*, *and bog iron ore*.§ The *sparry iron stone* has also been discovered and used. These different kinds are among the most valuable species of the mineral. They all yield an abundant per centage of ore, so as in most cases to bring a handsome profit to the proprietors. Several local circumstances conduce to this end. The cheapness of charcoal, the almost inexhaustible supply that our forests promise, the beds of coal that are continually discovering, are all arguments in favor of our nurturing this domestic manufacture. The only deficiency appears to originate from the want of work-

† Oddy's European Commerce, vol. 2, p. 290.

‡ Jameson's Mineralogy, vol. 2, p. 273. Chaptal calls it Rosalgia.

* Jameson's Mineralogy, vol. 2, p. 271. The various regulations adopted by the crown and the iron masters are noticed by Oddy, and also in Portia's travels in Sweden. Vide Pinkerton's Collection of Voyages and Travels, vol. 6th.

§ In noticing various minerals, I have adopted the names, and in general the arrangement, used by Jameson in his system of oryctognosie.

men who are sufficiently intelligent, or acquainted with modern improvements. The consequence is, that the iron has not been properly prepared, and holds in our markets a comparatively small value, on account of its inferior quality.‡ A short period of time will doubtless remedy this defect. Men of capital and information are taking these establishments into their hands, and will press into their service American ingenuity and talents, together with all the aid that emigration affords.

Although foreign iron, (particularly Russia and Swedes) has in general the superiority of character in our markets, yet there are some instances in which American ranks higher than either; this is particularly the case with that manufactured at the *Ancram iron works* in this state. It is said to be superior to any now in use for iron wire, chains, &c. since it combines malleability and strength in a remarkable degree. This kind of iron sells at a higher price than either of the above.

An enumeration of what has been effected in this branch of manufactures, will evince our rapid improvement, as well as mark, what is yet to be done. Our domestic resources at this time supply us with almost every article that is needed in agricultural labors. Should it be found impracticable at any period to procure iron from foreign countries, the present works would doubtles be fully competent to meet the demand. The various implements which are necessary in husbandry, and the thousand uses to which different forms of this metal are applied on farms, together with those needed for domestic, and culinary purposes, employ much of the active industry of our citizens. Various mechanical occupations also consume a large quantity of iron. Ship building is an art in which a vast amount is used. The contrast between our situation, half a century ago, and our commercial greatness some years since, "when our thousand sails whitened every sea, and visited every shore," is a proud proof of our advancement in

‡ This fact is noticed by Mr. Gallatin in his report. Vide also Col. Gibb's notice of the Vergennes' iron works in Bruce's Mineralogical Journal, No. 2, p. 84.

naval architecture.‡ In some instances our progress is still more striking. Gen. Hamilton in his masterly report on manufactures states, that in the year 1790, there were imported into the United States 1,800,000 pounds of nails.† In 1810, (though we still imported this article in considerable quantity,) there were manufactured in this state alone, nails to nearly the same amount. The making of cut nails is claimed as an American invention*; if this be the case the nation possesses the honor, as well as the advantage of so useful an improvement. It appears to have originated in the state of Massachusetts as early as the year 1787.§

Steel is manufactured in several states|| from our own iron, where its quality will allow it to be done. From causes already mentioned, foreign metal is principally used. We are still indebted to England, and probably will be so a number of years, for our cutlery, and the finer species of hardware. The *toy shop of Europe*, as Mr. Burke styles it, must for a length of time furnish us with those articles that require many hands, and great labor in their construction.

It has been suggested by several distinguished chemists, and among others, by the venerable Nicholson,¶ that it would be highly advantageous, if the ore of iron could be immediately formed into steel, by expelling some of its su-

‡ Among the documents accompanying the report of the naval committee made at the present session of congress, there is an estimate of the expense of building a 74 gun ship, by Mr. Humphreys, a ship builder. The whole amount of cost is estimated at $342,700. Of this $39,100 is put down for smiths' works, anchors, &c. more than 1-9 of the whole expense.

† Page 83. Williams and Whiting's edition.

* By Gallatin, vide report.

§ In the town of Cummington, (Berkshire) they were first made from hogshead hoop. For these and several other important facts I am indebted to Mr. S. Stafford, one of the proprietors of an extensive iron furnace in this vicinity. [Since delivering the address I have been informed by Mr. Benjamin Peck, of Milton, (Saratoga county) that the credit of the invention is due to Mr. Josiah Waterman, of the town of Cumberland, in the state of Rhode-Island. It was commenced as early as the year 1776, and the first use to which they were appropriated was the making of cards—Mr. Peck is now a partner in the iron trade with the inventor's son.]

|| New-York, Pennsylvania, Massachusetts, and Delaware.

¶ Dictionary of Chemistry. Art. *Iron*.

per-abundant carbon. The method at present in vogue is tedious, and circuitous. The carbon is at first completely removed in making bar iron, and afterwards, there is a certain quantity re-incorporated in the preparation of steel. The above project certainly appears practicable, and deserves attention. There are some ores which are peculiarly suited for this experiment.

With the provisions of war which are formed from iron, this country is abundantly supplied. At several establishments, cannon, together with balls and shells, are already cast, and new ones are continually erecting. Arms are manufactured by enterprizing individuals, as also at the national repositories. The founderies for heavy machinery such as is used in mills, steam boats, &c. deserve distinguished notice.

Among the various compounds of iron, there are some which deserve attention from their extensive employment in the arts. *Iron pyrites*, or sulphuret of iron, is one of these. From it the *sulphate of iron*, or copper as, an article much used in dying, is formed. It is manufactured in large quantities in the states of New-Jersey, Tennessee and Vermont.† The process by which it is obtained is so simple, that it requires but little ingenuity and care to prepare it pure. The New-Jersey copperas is by many considered superior to the imported article.*

The *chromate of iron* has been discovered by Mr. Godon in the vicinity of the city of Baltimore. By combining the chromic acid with lead, a most beautiful pigment of a yellow colour is obtained. In this form (chromate of lead) derived from the above mineral, it has several times been used by coach painters in Philadelphia and New-York, but the small quantities which are found of the chromate of

† The quantity of copperas annually manufactured in Tennessee is 56,000 lbs.—in Vermont 8000 lbs. Mitchill's View of Amer. Manufactures, in Amer. M. & P. Register, vol. 2, p. 411. By calcining copperas to a red heat, the *crocus* of commerce is formed.

* Pyrites is found in other states, besides those above enumerated, particularly in New-York and Massachusetts.

iron, and the great expense incident to its preparation, will probably prevent its extensive use.‡

Emery is said to have been lately discovered in Schoharie and Washington counties in this state. It has also been found in South Carolina. This substance is a compound of silica, alumina, and iron. Its hardness is so great, that it is used for cutting and polishing metals and precious stones.

There are several other minerals which derive some of their important qualities, from minute quantities of iron. These will be noticed hereafter.*

In the scale of importance *Copper* holds a station only inferior to iron. Its history is however not so creditable to American enterprize. It is found in the states of New-York, New-Jersey, Connecticut, Massachusetts, Virginia and South Carolina, and travellers also state that there are rich mines on the south side of Lake Superior, within the American territory. In many of these places, the ore is

‡ I have understood from Dr. Mitchill, that the prepared chromate of lead, sold at $2 per oz. He also mentions in his lectures, that a ferrugineous oxide of chrome has been discovered near Philadelphia.

* The length of the observations on iron has necessarily precluded the author from noticing some important facts. These may in some degree be condensed in a note. *Iron sand*, a species of magnetic iron stone, is said to occur in Virginia and from its purity makes excellent bar iron. (Jameson's Mineralogy, vol. 2, p. 276.) *Ochrey red iron stone*, or *red ochre*; this is probably the mineral mentioned by Dr. Williams as found in Vermont, and much used in the manufacture of nails. (History of Vermont, 2d edit. vol. 2, p. 360.) The *compact brown iron stone* is said to occur in this state. A mineral, supposed by Mr. Cutbush to be the *blue iron earth* of Werner, is found in New-Jersey. It makes a beautiful pigment. (Bruce, No. 2, p. 87.) The manufacture of *Prussian blue* ought not to pass unnoticed. It is produced by a union of the Prussic acid with iron—The former substance is the result chiefly of the decomposition of animal substances, at a high temperature. As a paint the *prussiate of iron* is highly valuable, and certainly can be made with advantage in this country. It may be proper to add, that the exertions lately made in this and adjacent states, to manufacture *iron wire*, are highly praise-worthy. Its value cannot be fully comprehended without recurring to the extent of our domestic manufactures of wool. After reviewing this article, I find that *hollow ware* is not explicitly mentioned. This is a very important and extensive branch of workmanship. The American founderies have almost destroyed the demands for European castings.

rich, yielding in some instances 75 per cent of pure metal, together with some silver, yet at present there is not a copper mine worked in the United States. Congress in 1800, authorized the President to employ an agent for the purpose of exploring the country near Lake Superior. This enterprize, which promised us an acquaintance with our mineral riches, was abandoned, before the agent had commenced his journey.† In 1719, a copper mine was discovered in New-Jersey, by Mr. Schuyler, situated between the Passaic and Hackensack, which still bears his name. The ore was found to be rich, but was shipped to England in its raw state, in consequence of the prohibitory regulations of the British government. Before the year 1731, the proprietor had exported to Bristol, about 1386 tons. The mine continued to be worked with success, until the commencement of our eventful revolution, since which period the attempts made to work it have failed.‡

Copper in its various mineral forms has been found in different parts of the country, and many elegant specimens adorn the cabinets of American mineralogists.* The copper used in the arts is however altogether imported. It is procured from Cornwall in England, and from South America, principally in the form of sheets and bolts. In this state, it is applied to many important purposes. It is used in very large quantities in ship building. Coppering vessels is found to preserve them longer from the effects of warm climates, as also from the attacks of the *Teredo Navalis*, which destroys the wood. It facilitates sailing, by presenting a smoother surface.

The various mordants, which have this metal for a basis, such as the *sulphate*, and *acetate of copper*, commonly known by the names of blue vitriol, and verdigris, are altogether obtained from foreign countries. The latter is procured from France.

† Med. Repository, vol. 6, p. 211.

‡ Latrobe's account of the Schuyler copper mine in New-Jersey. Med. Repository, vol. 6, p. 319.

* Vide the additions of the American editor to the article *copper*, in Rees's Cyclopedia, for an account of the various species of copper found in the United States.

Copper is also extensively used in combination with zinc, tin, and other metallic substances. These alloys, together with their application in manufactures, will be mentioned, after noticing the original metals.

Zinc has been discovered in the state of Pennsylvania, in the form of *sulphuret*, or *blende* as it is styled by mineralogists. It is found on the banks of Perkiomen creek, near Philadelphia.* Dr. Bruce lately analyzed an ore of this metal, brought from New-Jersey, and calls it *red oxide of zinc*. It is observed at various iron mines in that state. From the examination of that accomplished mineralogist, it appears that 76 parts out of the hundred are pure metal. He adds that it is preferable to other ores, since it forms with copper, an alloy superior in malleability and colour.†

Zinc is imported from Europe under the name of *spelter*, which is a mixture of brass and zinc, and from India under the denomination of *tutenage*, which from analysis appears to be almost pure metal.‡ From the circumstance of its malleability at a high temperature, a property lately discovered, it is probable that zinc will become an important article in manufactures. Its principle use at present, arises from its combination with copper, forming the alloy, called *brass*.

Tin is procured from England, South America and India. It is imported in the form of sheets, which is iron tinned over, or of block tin. From the first are manufactured vessels for culinary and domestic uses. This branch of industry is almost solely monopolized by the states of Connecticut and Massachusetts. It is estimated that in the former, tin plates and iron wire to the amount of $250,000, are annually used in this manufacture, and the annual value of the

* Woodhouse's analysis of the Perkiomen zinc ore, in Coxe's Medical Museum, vol. 5, p. 133. Concerning blende, professor Jameson observes, "it *sometimes*, though *extremely rarely*, is worked as an ore of zinc." This probably *sums up* the controversy between Drs. Woodhouse and Seybert, on this subject, in Coxe's Med. Museum, vols. 5 and 6.

† Bruce's M. J. No. 2, p. 96.

‡ Chaptal's Chemistry applied to the arts and manufactures, vol. 2, p. 210, Lond. edit. Vide a very curious correspondence on tutenage and spelter in the Med. Repos. vol. 15, p. 107.

tin plate works of Massachusetts, according to the enumeration of 1810, is $87,000.‡ These wares are sold throughout the union, from Louisiana to Vermont.

Tin is also used in coating articles made from iron, to remedy the inconvenience arising from the facility with which the latter metal rusts. In this form, many things are prepared, particularly such as are required in horsemanship, such as harness, stirrups, bridles, &c. Several small establishments of this nature are springing up in various parts.

The principal application of block tin, is its union with lead and antimony, forming the compound called *pewter*, from which various articles are made.*

Among the alloys of copper, a notice of those most important, as well as most commonly used in the United States, will be sufficient.

Brass is the most valuable. It is generally formed, by calcining the calamine (the ore of zinc) with charcoal, and afterwards fusing the compound with plates of copper. After refining it, the brass becomes an article of commerce, and is imported into this country, principally from Great Britain, whose mines of calamine in Derbyshire, supply a large proportion of the brass works in Europe.† This alloy is found to be infinitely more ductile than the original metals, and is in consequence drawn into wire, from which pins, sieves, &c. are manufactured. In this country it is principally used in the making of stills, and other vessels. Buttons are also made in small quantities.§

The union of copper and tin forms *bell metal*. A foundery for casting bells was erected more than forty years since in Massachusetts,‖ and the business has been continued in that state ever since; in 1810, the value of those cast

‡ Morse's Geography, article *Massachusetts*.

* It is stated in Mr. Spafford's Gazetteer of the state of New-York, (now in the press,) with which I have been favored by the author, that *ores of tin* have been found in the Highlands, and in Essex and Clinton counties.

† Chaptal's Chemistry, vol. 3, p. 285.

§ The union of copper and zinc by various processes, and in different proportions, forms pinchbeck, tombak, tinsel, manheim-gold, &c.

‖ Holmes' Annals, vol. 2, p. 296.

was $8,555. Similar establishments exist in Philadelphia, and in the vicinity of this city.

Brass guns, as they are styled, are formed from a similar compound; the zinc is generally considered a useless addition. They are cast at several founderies.

The tinning of copper vessels for domestic purposes, is a common occupation. From the deleterious properties of copper, it has been proposed to substitute zinc; and the project certainly deserves encouragement.§

Tin is found to have a great affinity for mercury, and has in consequence been used in silvering *looking glasses*. This trade is conducted to a considerable extent in our large cities.

Traces of several other metals have been observed throughout the United States.

Antimony has been found in the state of Connecticut, and indications of its existence are said to occur in the southern states and Louisiana. When it is recollected that in conjunction with lead, it forms *type metal*, its value appears manifest. Without it the art of printing, an art, which rescued the world from barbarism, cannot be conducted.†

A mine of *Cobalt*, combined with arsenick, has been discovered in North Carolina, and another of the same kind (*white cobalt*) exists at Chatham (Connecticut.) In its state of oxyd, this metal is used for giving various shades of blue to glass and enamel. All the *zaffre* and *smalt* (the names by which it is known in commerce) used in this business are at present made in Germany.* It is contemplated to commence a manufactory of smalt at the North Carolina mine.

Manganese in the state of black oxide, has been discovered at Anteram,‡ and several other places in this state, and *molybdena* exists in various situations. *Arsenical pyrites* are found in the district of Maine. To Mr. Hatchett we are in-

§ Various proportions of copper and tin, form bronze and speculum metal.

† Chaptal mentions that the best proportion for type metal is 80 parts of lead, and 20 of antimony. The antimony renders the compound harder, but if too much be added, it becomes brittle.

* Vide Rees' Cyclopedia, art. *cobalt*, for a detail of their manufacture; also Nicholson's Dictionary of Chemistry.

‡ By Dr. Bruce, vide Med. Repository, vol. 11, p. 442.

debted for the analysis of *columbite*, containing a metal once supposed peculiar to this country, but which the latter investigations of Wollaston have identified with tantalum.‡ *Menachanite*, *rutile*, and *negrine*, all species of *titanium* or *menachine*, have been observed.†

In *Silver* and *Gold* we fortunately are not abundant. To our citizens indeed the discovery of a bed of gypsum, or of salt, would be of infinitely greater use than the possession of the Peruvian mines. The latter metal has however been found in Virginia on the surface of the ground, and in Cabarras county in North Carolina—In 1805 a quantity of virgin gold was brought from the latter place to the national mint, and coined into money to the amount of $11,000. It still continues to be found in creeks, and the sand bordering on them. In coinage, copper is added to the gold to give it tenacity.

The manufacture of plated ware, and jewelry, is very extensive, and valuable. Mr. Gallatin states the annual value of the first alone, in Philadelphia, at $100,000. This trade flourishes in every city on the continent.

It remains to notice a metal of great value in the arts, viz. *Lead*. It has been discovered in several of the northern and middle states.* At Perkiomen in Pennsylvania, a mine is worked, yielding an ore which produces 70 per cent of metal, together with some silver. Lead mines also exist on the Kanhawa in Virginia; but the greatest are in Louisiana, in which country it is said that the metal is found over a tract 60 miles in length, and 20 in breadth.§ From analys is, it appear to bequite pure.‖ The establishments for smelting the ore are not sufficiently matured, although

‡ Bruce No. 1. Appendix. Gov. Winthrop sent this mineral to Sir Hans Sloane, whose collection forms a part of the British Museum.

† Maclure's Observations on the Geology of the United States in the American Philosophical Transactions, vol. 6, p. 421.

* At Northampton (Mass.) vide Silliman's account of this mine (Bruce, No. 2, p. 63.) and in New-York and New-Jersey.

§ Vide Amer. M. and P. Register, vol. 2, p. 33. Also Stoddert's sketches of Louisiana.

‖ Vide Meade's Analysis of an ore from Louisiana, (Bruce's Mineral. Journ. No. 1, p. 7.)

lead to the amount of 912 tons was prepared in 1807. A few years will probably accommodate the supply to the demand. At present, the metal, together with its manufactures, and red and white lead, are imported to the amount of 2,375 tons, although the two latter articles are manufactured in considerable quantities in this country.*

Various species of lead ore have been discovered, such as the *molybdate*, (yellow lead ore) *sulphate*, (lead vitriol) and *muriate* of lead (Kidd) at Northampton,§ and the *phosphate* of lead (green lead ore) at Perkiomen,‡ but the common ore found, and indeed the only one worked as an article of commerce and manufactures, is the *sulphuret of lead* or *galena*. After roasting it to expel the sulphur, it is mixed with charcoal, and reduced in a furnace. Silver which is an important result, is obtained by cupellation; and the oxyd which remains in the form of a semivitrified mass, is stiled *litharge*, a substance used together with minium, masicot, and ceruse, (all oxides but of different colours)|| by painters, potters and glass workers.

The principal manufactures of lead are those of *shot*, and of *painter's colours*. The former are prepared by pouring the melted metal from a great height, and afterwards sorted by passing them through seives of various sized holes. The establishments for this purpose, at Philadelphia and in Louisiana, are said to yield 600 tons annually, sufficient for the late demand. It has now, since the declaration of war, increased, and thus offered a new argument for exploring and working our lead mines.

Painter's colours are prepared in several places. Besides these, lead is formed in sheets for the covering of houses, and into door and window weights, and alloyed with copper, forms what is styled *pot metal*.

Mineralogists have generally divided their kingdom into four classes. *Metals; Inflammable Fossils; Saline Sub-*

* Gallatin's Report. § By Dr. William Meade, Bruce 3, 149.
‡ By Mr. Godon (Bruce 1, 30.)
|| *Minium*, red; *massicot*, yellow; *ceruse*, white; *litharge*, reddish yellow, or orange. Minium is used in making flint glass, and for the glazing of pottery.

stances, and *Earthy Substances*. In conformity to that arrangement, having noticed the metallick substances which are found in our country, I proceed briefly to mention those belonging to the other divisions, which are native.

Coal is an article arranged under the class of *Inflammables*. This substance, which is daily becoming more valuable on account of the increasing scarcity and price of wood, has been found in various situations. It is now generally allowed, that it has a vegetable origin, but theorists differ as to its formation. The Wernerian attributes it to an aqueous process, while the Huttonian supposes heat acting under partial compression, to be the cause.† The phœnomena attending the discovery of coal in this country may probably strengthen one or the other of these hypotheses. Coal in a general way may be classed into two divisions. *Bituminous* coal, a kind which is highly inflammable, and burns with a vivid flame. This species is used for fuel, and answers the required purpose; but for various mechanical occupations, such as the smelting of iron ore, drying malt, burning of lime, and making earthen ware, coal is required that will give a strong, and steady heat, without evolving any smoke or bituminous vapour. For this purpose, the English coal, which is generally of the bituminous kind, is exposed to a great heat, and its volatile parts expelled. It is then called *Coke*. Some years since the Earl of Dundonald suggested a plan of saving these volatile products, which was adopted by him with great success.‡ The bitumen was condensed into tar, and it is said that by this method the English marine, was for several years, supplied with that important item in ship building.§ *Another species of coal* is that which is found destitute of bitumen, and in consequence is used in the arts without any previous preparation. Of this nature is the Kilkenny coal, which from analysis is

† Vide Murray's System of Chemistry, 2nd edit. vol. 3, p. 636. For some curious facts connected with this subject, vide the notice of, and extracts from the paper of Dr. Nugent, on the pitch lake of Trinidad, in Edin. Rev. No. 37, art. 9.

‡ 120 tons of coal yielded 3 1-2 tons of tar. Nicholson's Dictionary.

§ Chaptal's Chemistry, vol. 3, p. 342.

found to contain 97 parts of pure carbon out of the 100,* and the anthracite or glance coal (blind coal.) Both these kinds are found in the United States. The former exists in Virginia, on both sides of the James' river, over a tract of 15 or 20 miles. It has already become an important article in domestic commerce. The latter has been discovered in the state of Rhode-Island, in a state almost as pure as the Kilkenny coal; † and in Pennsylvania, at Wilkesbarre, and on the Lehigh.‡ Indications of this mineral are found in the states of New-York, New-Jersey and Maryland.

In searching for coal, it is of importance that the persons engaged, should be well acquainted with the proper indications. In this country, much expense has often been unnecessarily incurred, in consequence of the ignorance of miners. An enterprise of this nature ought to be committed to a practical mineralogist, who has not only been conversant with the coal countries in England, (the rich reservoirs of this mineral,) but also understands the substances which usually form the super-incumbent strata. Much useful information may be gathered from books, particularly William's History of the Mineral Kingdom, from which an extract has been re-published in this country by Dr. Bruce.§

Should our present supply of *Sulphur* from Italy be at any period stopped, it might doubtles be obtained in sufficient quantities from the decomposition of pyrites and other metallick minerals.¶ It is said to exist in large quantities in the volcanic tract in Louisiana. Sulphur springs are found in various states. At the Clifton Springs in Ontario coun-

* Kirwan's analysis of various species of English coal, in Murray's Chemistry, vol. 3, p. 635.

† Carbon 94, ashes 6. "Vide "an enquiry into the chemical properties and character of that species of coal lately discovered in Rhode-Island, &c." Published in the 3d supp. to Barton's Med. and Physical Journal, p. 221.

‡ Strata of coal are found at Pittsburgh, and probably extend into the state of Ohio. It is also found in Tennessee, and the Indiana and Illinois Territories.

§ Bruce's M. J. No. 3, p. 166.

¶ Sulphur is obtained from pyrites in Saxony and Bohemia (Nicholson.) A cheap way of making sulphur from metallick minerals, practised at Ramelsburgh in the Hartz (Germany) is mentioned by Chaptal, vol. 2, p. 271.

ty, it appears to be a deposition from the sulphurcous water, and is obtained in large quantities on the ground. In some specimens, from that place, Mr. Godon detected the sulphuric acid, in a free or uncombined state.*

Sulphur is applied to various important uses in the arts. It is an ingredient in the making of gun powder, its vapor is used in whitening wool and silk, and from it the sulphuric acid or oil of vitriol is often made. In a single establishment at Philadelphia, about 200,000 lbs. of it and other acids, are annually manufactured.†

Amber has been found in New-Jersey,‡ and *Petroleum*, under the name of *Genesee* or *Seneka Oil*, is obtained in the western district of this state. This substance in its purest forms (when it is called *Naptha*) is used in Persia, and Japan, where it abounds, for lighting streets, and several other domestic purposes.§

Mines of *plumbago*, or *black lead (graphite, carburet of iron)* are said to occur at Brimfield (Mass.) and in Virginia. It is also found in various parts of this state; although it is generally understood to be too hard and coarse for the purposes to which it is commonly applied, which is the making of pencils. The purest plumbago, and the article used in commerce, is obtained from Borrodale (Cumberland) in England. In conjunction with clay, it is used in manufacturing crucibles for the smelting of metals.

Under the denomination of *Saline Substances* is included those combinations of acids with alkalies and metals, which are found native. The salts of alumine, although an earth, are generally included.

Muriate of Soda, or common salt, deserves the first notice. This invaluable mineral is discovered in the state of rock salt, or is obtained from salt springs or sea water.|| Of the

* Vide Medical Repository, vol. 12, p. 200.
† Gallatin's Report on American Manufactures.
‡ Bruce's Mineralogical Journal, No. 1, p. 31.
§ Jameson's Mineralogy, vol. 2, p. 47.
|| In some instances salt is annually reproduced; as in the valley of salt from which the city of Aleppo is supplied. Vide Russel's Natural History of Aleppo, 2d edit. quarto, vol. 1, p. 55—6.

first variety, the rock salt of Cheshire,* and the salt mines of Weileicska in Poland are examples.† It sometimes forms hills; such is the case at Cordova in Spain, and in Moldavia.‡ In this country the mineral is found in a state of solution in salt springs. No traces of rock salt have yet been discovered, although it appears to be the united opinion of mineralogists that such springs communicate with, or originate from beds or strata of that substance.§ The principal places in the United States, where salt has been found are the following. In the state of New-York, in the counties of Onondaga, Cayuga, Genesee, Seneca, and Ontario. In 1800, these produced 42,754 bushels, and 1810, 543,000.‖ In Virginia and Tennessee—In Ohio, on the Scioto—In the Indiana Territory, on the Wabash.¶ In Kentucky, where 5 springs supply 36 works, which manufactured in 1810, 324,870 bushels.** Salt is also found in Louisiana. This mineral is also made from sea water by spontaneous evaporation. Works for this purpose have been established at various places on the coast. At Sagharbor, in Massachusetts,†† and in North-Carolina.‡‡ With all these resources we are still obliged annually to import three millions of bushels of salt,§§ of which more than one half was obtained from

* Vide Holland's Survey of Cheshire.

† These mines have been worked since the year 1251. They are 900 feet deep, and extend more than a league from east to west. (Jameson's Mineralogy, vol. 2, p. 15.) ‡ Ibid.

§ Kidd's Mineralogy, vol. 2, p. 9.

‖ The following is the amount made in each county, taken from Goodenow's Statistical Manual of this State, p. 9.

In Onondaga,	453,840	I am informed by Dr. Kirkpatrick, superintendent of the Onondaga Salt Works, that a million of bushels of Salt might be made annually at the works in the western district.
Cayuga,	54,000	
Genessee,	1,400	
Seneca,	25,000	
Ontario, about	8,760	
	543,000	

¶ 130,000 bushels were made in 1810, on the Wabash.

** Morse's Geography, *art.* Kentucky.

†† In Massachusetts there were 118,757 bushels made in 1810, and the works extended over 468,198 feet (Morse.)

‡‡ Works covering 275,000 feet were not long since erected there, (Gallatin.)

§§ Gallatin's letter on the importation of salt, Med. Repos. vol. 12, p. 285.

Great Britain,* and a large proportion of the remainder from Spain and Portugal. Among those various foreign kinds, the bay salt of the latter countries is preferred, for preserving meat. It is made by spontaneous evaporation from sea water.† Should our foreign importation be cut off, the demands for domestic consumption, must principally be supplied, from the sea coast. The improvement of the establishments there, ought to be effected by all possible means, and the best method of doing this, will be by a comparison of the various modes adopted in foreign countries. Those pursued in England, France, on the Mediterranean, and in the West-India Islands, may all be found in different writers on the subject.‡

Sulphate of soda, or *Glauber's salts*, is also a constituent in sea water. It is procured from it in large quantities, so much so that the waters of the Mediterranean yield it nearly in the proportion of 155 parts of their own weight.§ This substance is obtained from the mother liquor or bittern, (as it is called,) remaining after the common salt has been made. At several works on the sea coast, it is manufactured in very large quantities, so as at present to exceed the demand.‖ Soda might however be extracted from it, were not that alkali altogether supplanted by potash, in this country.

Sulphate of magnesia is obtained from mineral springs, and in this country is not unfrequently made from sea water. It is stated to have been found native, in caves in Munroe county (Virginia.)¶

* Vide "an analysis of several varieties of British and foreign "salt, with a view to explain their fitness for different commer-"cial purposes, by William Henry, M. D. F. R. S." in Mease's Archives of Useful Knowledge, vol. 2, p. 117.

† The mode of manufacturing bay salt is stated in Mease's Archives, vol. 2, p. 345.

‡ For an account of the modes pursued in England, and France, vide Chaptal's Chemistry, vol. 4, 160 et seq; in Bavaria, vide Nicholson; on the Mediterranean, and in the West-India Islands, vide Mease, vol. 2, p. 345.

§ Chaptal's Chemistry, vol. 4, p. 10.

‖ In 1810, 334,238 lbs. were made in Massachusetts.

¶ Coxe's Medical Museum, vol. 1, p. 95.

The nitric acid in union with potash forms another important mineral. *Salt petre*, or *Nitre*, as it is called, is observed at various places in Europe and Asia, in the form of an efflorescence, on limestone rocks and caverns,* but the article used in commerce is generally the result of artificial processes. It is usually made from the decomposition of animal and vegetable matter, formed into beds, and exposed to the action of the air. The oxygen of the atmosphere, and the azote originating from the disorganization of the materials used, unite and form nitric acid, which is combined with the potash of the beds.† This compound undergoes purification, and is then used in manufactures. Nitre was made in 1810, in several of the southern states together with Massachusetts to the amount of near half a million of pounds.‡ In the state of Kentucky, calcareous caves are found in considerable number, containing this mineral in combination with the earth. From this, it is extracted by lixiviation, and afterwards boiled to the crystalizing point. This is the mode commonly pursued both in this and in foreign countries. In France, however, at the eventful crisis of her revolution, it was found too tedious, and indeed insufficient to supply the armies with this important constituent in the making of gun powder. Purification by repeated ablutions, which carries off the deliquescent salts, was then adopted with success, and from that period to the present has been universally followed in that country.§ In one cavern alone, in Kentucky, it is calculated by Dr. Brown, that

* This is annually re-produced. The theory of its formation is stated in Murray's Chemistry, vol. 3, p. 453.

† Vide an account of the modes pursued in Prussia, Sweden, Malta, and Switzerland, for the making of nitre, in Chaptal, vol. 4, p. 128.

‡

Virginia,	59,175
Kentucky,	201,937
Massachusetts,	23,600
East Tennessee,	17,531
West Tennessee,	144,895
	447,138 lbs.

Mitchill's View, &c. A. R. vol. 2, p. 296.

§ Chaptal's Chemistry, vol. 4, p. 138.

there is one million of pounds of nitre.* Nitre is also manufactured in Virginia, and Tennessee, where it is found in limestone caves. A natural saltpetrous earth has been lately discovered in the former state, along the banks of the Potomac.†

In the making of gun powder, it is of the first importance that all the materials be perfectly pure, as well as mixed in proper proportions. Above all, it is necessary that no foreign substances be contained in the salt petre. If sulphate of soda be united with it, the compound is found to effloresce, whereas a combination with the nitrate of lime causes deliquescence. The dampness of American gun powder has already been complained of,‡ and can alone be remedied by a strict attention to the purity of the ingredients. It is extensively manufactured in several states, particularly Delaware and Maryland,§ and though it is still imported in considerable quantities, may doubtless at any period be produced in proportion to the demand.

The *sulphates of iron and copper*, when they do occur native, are generally the result of the spontaneous decomposition of iron and copper pyrites. The *sulphate of zinc* or white vitriol is made from blende.

Alum or *sulphate of alumine* may be obtained from the decomposition of pyrites, and is not unfrequently manufactured from *aluminous shale* or *schistus*, a substance found at various places in this country. Its important use is as a mordant in dying.

The *muriate of ammonia* or *sal ammoniac* is made in Philadelphia.

* Description of a cave on Crooked creek, with remarks, &c. on nitre and gun powder; by Samuel Brown, M. D. (Amer. Philos. Trans. vol. 6, p. 235.)

† Med. Repos. vol. 12, p. 296.

‡ Vide Dr. Mitchill's letter on this subject to the Secretary of the Navy, Med. Repository, vol. 6, p. 426.

§ Gallatin's Report. The mills at Brandywine makes 250,000 lbs. annually, and two near Baltimore 450,000. According to Mitchill, the gun powder mills in 1810 amounted to 207, and the quantity annually made to 1,450,000 lbs. Modes of preventing the explosion of mills are detailed in the Med. Repository, vol. 12, p. 389, and Mease's Archives, vol. 2, p. 403.

I proceed to notice a few of the minerals belonging to *Earthy Fossils*, the fourth and last class, and first of *Lime*. This substance exists in nature in various states of combination, all of which are appropriated to important purposes in the arts. No one however is used more frequently than the *carbonate*. It exists in large quantities over every part of the globe, and is often the basis of whole districts of country.* Its forms are so various, that it has received many different appellations. *Lime stone* is used principally in masonry, and is also applied in the manufacture of glass and smelting of iron ore. By calcination, the carbonic acid is expelled. Until this substance was discovered in this country, the deficiency was severely felt. In 1644, the fort on Castle Island, (Massachusetts) fell into premature decay, as it was built from lime burnt from oyster shells,† a carbonate also, but not sufficiently endowed with the property, of hardening by exposure to air, which the native mineral possesses. Lime is now found of a superior quality in the state of Rhode-Island, from which all the adjacent states are supplied. It is often met with in other parts. In its compact, hardened forms, combined with clay, silex, and often iron, it is used for building.‡ To this class is to be referred the *freestones* so frequently found in large quantities. Some species of it are apt to peel and crumble by exposure to air and water, and particularly by the operation of cold on a moist atmosphere, as is the case in England. For the building of temples to their gods, and palaces to their kings, the Egyptians used granite and porphyry, substances durable as the earth, and which will still remain, the wreck of past ages, after modern architecture shall have crumbled into ruins.§ *Marl* and *calcareous slate* also belong to this species. The one being a carbonate combined with a cer-

* Such is the case in the south of England.

† Holmes' American Annals, vol. 1, p. 331.

‡ Westminster Bridge is built of Portland stone, a species of lime stone, (Kidd, vol. 1, p. 21.)

§ Vide a paper "on the application of mineralogical and chemical science to the selection of stone for the purposes of durable architecture," by Robt. Bakewell. Mease's Archives, vol. 2, p. 157.

tain proportion of clay, so as to crumble on exposure to air, and the other, the same compound in a more hardened form. Marls are used in agriculture, principally on moist land. Pits of them exist in Orange county, and traces in various other places. The calcareous slate (lapis tegularis) is used in large quantities for the covering of houses and for flagging. It abounds in several districts. *Dolomite* or *carbonate of lime and magnesia* is not uncommon. But the most elegant variety of carbonate of lime, is *granular lime stone* or *marble*. Its colour, when pure, is perfectly white, but it is often found tinctured with various shades. Quarries of this substance are very numerous in the United States. In Vermont they extend over a large district of country, and they have been opened in most of the northern and middle states. The beauty of many of the kinds can hardly be excelled. Besides its uses in architecture, it deserves notice, as the basis of the sublime art of statuary. The marbles of our country are as pure, and indeed have almost every requisite in as great perfection, as the far famed ones of Italy. The encouragement of this branch of the fine arts ought not to be neglected. Indeed, a genius for painting and sculpture appear to be the birth right of republicans. Grecian glory still lives in her Venus De Medicis,* and Apollo Belvidere, and at the present day, American painters hold a high rank in the scale of excellence. Centuries have tried the experiment, and time has conclusively decided, that if ever a Phidias or a Praxiteles are to be rivalled, their competitors must arise in this quarter of the globe. These arts ought to be fostered, if in no other way than as merely *useful* ones. They animate genius to its best exertions, reward the soldier's deeds, and transmit to posterity an almost breathing transcript of the heroism, the virtues and the talents of their forefathers. The want of patronage is a disgrace to a free state. It stamps that republic with the seal of the basest ingratitude, who has suf-

* The Venus De Medicis, and Venus of the Capitol are of Parian marble. (Kidd.)

fered her greatest and best son to lie low in dust, "no *marble* tells us where."

Sulphuric acid and lime united form *gypsum*. From that obtained at Montmatre in the vicinity of the capital of France, the plaister of Paris used in commerce, is formed. *Sulphate of lime* is found in a state of great purity in Onondaga* and Madison counties, and on the borders of Cayuga lake. The quantities procured there are very great, and supply many parts of this and adjacent states. During the last year, it is calculated that 6000 tons have been sent into Pennsylvania from the vicinity of Cayuga lake.† It is also discovered in New-Jersey. Besides its very important use in agriculture, it is employed for the formation of stucco, and in modelling, if it be of uniform texture, and sufficiently delicate colour. Several beautiful specimens of *fibrous gypsum* have been found at Onondaga.

Fluate of lime or *fluor spar* has been noticed in New-Jersey, Connecticut, New-Hampshire,‡ and Virginia.§ Ornamental vases of various colours are made from it in Derbyshire, (England) where a mine is found. The acid is used in etching on glass.

Mr. Godon has observed the *phosphate of lime* in Pennsylvania.‖ In the province of Estramadura, in Spain, it forms hills, and is used in building.

Many other varieties of calcareous fossils have been noticed; they are however unimportant in the arts. I cannot however leave this subject, without noticing the *elastic marble* found in Massachusetts.¶ Beautiful specimens of this uncommon mineral are in the possession of the mineralogical committee.**

* Vide Warden's analysis of Onondaga sulphate of lime, in the Med. Repos. vol. 13, p. 76.

† This information was communicated to Simeon De Witt, Esq. by J. Geddis, one of the corresponding secretaries of the Society.

‡ Bruce, No. 1, p. 32. § Ibid, No. 2, p. 79. ‖ Ibid, No. 1, p. 30.

¶ A notice of this substance by Dr. Meade is contained in Bruce's M. J. No. 2, p. 93.

** I am informed by my friend Dr. Noyes, Prof. of Chemistry and Mineralogy at Hamilton College, that a substance resembling *chalk* in all its properties, has recently been noticed in several towns in Oneida county. It has been used instead of lime in masonry.

Magnesian fossils are quite common. Among those noticed, are the *tremolite*, *actynolite*, *chlorite* in its earthy and slaty forms, together with *talc*. *Serpentine* is found in Rhode-Island,* also at Hoboken in New-Jersey. This place is probably the richest in magnesian minerals, of any in the northern states. Beautiful specimens of *amianthus* are found, and some years since, Dr. Bruce discovered at that place, *native magnesia*, a substance altogether unknown on the eastern continent. *Asbestos* and *steatite* are frequently met with. In general it may be observed, that fossils of this class, are objects of curiosity, rather than of importance. Serpentine, steatite or soap-stone, and some others, are however used in the arts. They are occasionally turned, and polished into vessels of various shapes. At Zoblitz in Upper Saxony, there is an extensive manufactory of the latter article.†

Zircon, which was once supposed peculiar to Ceylon and Norway, has been detected at Trenton (New-Jersey) by Mr. Conrad.‡ It is used as a gem.

To the same purposes are appropriated the *emerald* and *beryl*, minerals arranged under the denomination of *Glucine* fossils, that earth forming a constituent part of their composition. Emerald is found near Boston and in Virginia.— Beryl or aqua-marine in the vicinity of Northampton (Mass.) in Maryland, and in Pennsylvania.§

Barytes has been discovered in its form of *sulphate*, in Sussex county, (New-Jersey) and in Maryland. The crystalized variety or *baroselenite* has also been observed.||

The varieties of *Alumine* which are found in this country,

* Med. Repos. vol. 8, p. 62.

† In the returns of manufactures for Massachusetts for 1810, there is inserted the following, "Soap Stone Manufactory $13,000." From the best information I am able to obtain, the above substance appears to be a species of *potstone*, or *lapis ollaris*. It is procured from New-Hampshire, and is often used in the making of fire places, and stoves.

‡ Bruce, No. 3, p. 127.

§ Dr. Luce, a member of the mineralogical committee, has in his collection, specimens of both minerals from Massachusetts.

|| Vide Seybert's catalogue of American minerals in Coxe's Med. Museum, vol. 5, p. 265.

are very numerous, and they form the basis of many important manufactures. *Ochres* of various colours, have been observed in several states. In these minerals, the clay is united with minute portions of iron, which gives them their various tinge of red, brown, and yellow.* These shades may be varied by the application of heat. They are employed for crayons, but are principally used as paints, in union with the dying oils, for the purpose of protecting edifices from the effects of air and rain. *Common clay* is used in the manufacture of bricks,† and *pipe clay*, which is found in Vermont, receives its name from its use. *Potter's clay* is a common production,‡ and *fuller's earth*, a species so highly valued in Great Britain in the manufacture of woollen cloth, that its exportation is forbidden by an act of parliament, is said to have been discovered in South-Carolina.§ In addition to these, may be mentioned *loam*, a compound of great importance in soils, and *feldspar*, which in its decomposed state, is used in the making of porcelain. From the analysis of Mr. Cloud, an officer in the United States mint, it appears that this mineral exists at Monkton in the state of Vermont.‖ It is this substance under the name of *kaolin*, or *petunze*, from which the Chinese porcelain is made.

The several *clays* that I have noticed, are used in the mak-

* The *Terra lemnia* found in the Island of Lemnos, is a red ochre. *Brown ochre* is often called *umber*, from a place in Italy, where it is found, (Kidd.) The difference between boles and ochres, consist, in the latter containing most iron.

† 25 million were made in one year in Mssachusetts (Morse.)

‡ Clays are generally composed of silex, alumine, and oxyd of iron—*Common brick clay* contains considerable iron. *Potters clay* has generally some lime in its composition, which occasions it to vitrify on exposure to heat. *Pipe clay* on analysis, resembles *porcelain clay*, but the siliceous particles are not sufficiently fine for the latter use. The *clay* of *Limoges*, from which French porcelain is made, consists of silex, alumine, and oxyd of iron.

§ *Fuller's earth* contains a certain proportion of alumine, (not more or less than a fourth or a fifth of the whole mass) so as to render it diffusible through water. It is also necessary in order to answer its use, that the siliceous particles be very fine, else they would wear out the texture of the cloth to which they are applied, (Kidd's Mineralogy, vol. 1, p. 176.)

‖ Med. Repos. vol. 14, p. 464.

ing of earthen ware of various kinds, and also in the fabrication of articles for numerous domestic purposes. The coarser kinds of ware are made in almost every district in this country, directly on the clay used in their composition. Several establishments for the finer ones, have lately been erected, and in Vermont, an incorporated company intend to manufacture porcelain.*

Mica or *isinglass* is in general classed with aluminous fossils. Until within a few years, it was altogether used in the Russian navy as a substitute for glass. From its great elasticity it is prevented from shattering at the explosion of cannon.† It possesses another useful property; that of resisting heat, and for this reason is often employed in the construction of stoves and lanterns.

To these may be added *schistus*, and *hornblende*, substances often occurring. *Clay slate* (*argillite* of Kirwan,) is the variety used for writing. *Whet-slate* or *honestone* (*Novaculite*) also belongs to this class, and is not uncommon. The honestone of commerce is brought principally from the Levant. *Cyanite* or *sapphare* (*Disthene* of Haüy) *jasper*, and *granatite*, (*Staurotide*) have all been observed.

The last primitive earth forming a constituent in the composition of minerals, which remains to be noticed, is *Silex*. A few of the species deserve to be mentioned, such as *quartz*, *rock crystal*, and *amethyst*. *Shorl* and *tourmaline* are often found, and the *indicolite* or *tourmaline azuré* of Haüy, a rare mineral in Europe, has not long since been discovered at Goshen (Massachusetts.)‡ *Calcedony*, *zeolite*, *melanite*,§ *semi-opal*, *garnet*, *hornstone*, *woodstone*, are all native substances.‖ *Flint*, so important in war, has been ob-

* For an elaborate detail of the compositions used for *enamels* in the manufacture of Delft and Wedgewood's ware, vide Chaptal's Chemistry applied to the arts and manufactures, vol. 4, p. 242.

† Jameson's Mineralogy, vol. 1, p. 34. I have to regret my inability to avail myself of the volume of this author on *Oeconomical Mineralogy*.

‡ Bruce, No. 2, p. 123. § Bruce, No. 1, p. 31.

‖ Seybert's catalogue of American minerals, in Coxe's Med. Museum, vol. 5, p. 155.

served in New-Jersey and Pennsylvania. Numerous quarries of *burr stones* (*arid quartz* of Kirwan) have been opened in several states. They have almost superseded the demand for French burrs.

A few observations on the manufacture of glass will close this subject.

This art, considered in a mineralogical point of view, is an extremely complex one. A union of silex and the alkalies form the essential ingredients, Other substances such as salt, lime and manganese, are also used; clay of a good quality is required as the basis of glass house pots, and crucibles. These various minerals are all indispensable in the establishment of a glass house. In this country, our works are becoming of great value for the supply of natural wants. A few years since there was manufactured sufficient to meet one half of the demand, (27,000 boxes) and the remainder was imported.* This deficiency must now be supplied at home.

In enumerating the various factories, those of our own state deserve the first notice. In 1810, the annual value of their products exceeded $700,000. They amount as far as my information extends to nine; eight for the making of window glass, and one for the manufacture of bottles in Oneida county.† Of the former, two blow crown glass, and six, cylinder glass.‡ The crown glass made in this state, is generally considered equal to any in this country, and bids fair to rival, if not surpass the imported article. That made in Boston has a high character. At that place, retorts, and other articles used in chemical and pharmaceutical operations are made. Flint glass in its various forms is made at Pittsburgh (Pennsylvania.)

The materials used in the works in this state, are obtained

* Gallatin. † This business will be commenced during the ensuing summer at the Hamilton factory in our vicinity.

‡ The crown glass factories are at Deerfield (Oneida county) and at Rensselaer (Rensselaer county.) The cylinder factories are the following: one at Geneva (Ontario county;) one at Peterborough (Madison county;) one at Oneida (Oneida county;) one at Hamilton (Albany county;) one at Rensselaer (Rensselaer county;) and one at Woodstock (Ulster county.)

from various places. The clay is procured from the banks of the Delaware, near Burlington. The siliceous sand employed in the crown glass factories, is brought from Lanesborough (Mass.) In Oneida county, it is found in several places of sufficient purity for the making of cylinder glass. That used at the Hamilton factory is obtained near Port Elizabeth, (New-Jersey,) on the bank of a small river which empties into Delaware Bay. The mineral used is potash, and the colouring matter, manganese, which is preferred on account of its cheapness, to cobalt.*

I have, I fear, exhausted your patience, without doing justice to my subject. Its extensive nature will plead my excuse, for the many mistakes and omissions that doubtless have been observed.

Such is the state of American mineralogy in its infancy. Such the progress of science and the arts in that country from which two centuries ago *micaceous sand* was exported as *gold dust*.† Its manhood may proudly be anticipated, by recurring to the persevering industry, the unconquerable enterprize and the extraordinary ingenuity of our citizens.

On a review of the subject, one deduction appears manifest. It is the intimate connexion that subsists between agriculture, commerce and manufactures. They are mutually dependant on each other. Conjointly, they form the pillars of the temple of society, and are in fact, the foundation of human enjoyment. Through their united effects, fishermen's huts have been transformed into emporiums of the world, nations have arisen from obscurity, and the earth has been made a fit dwelling place for the destined sons of immortality. The man who would overthrow the one, in

* For the information respecting the Hamilton and Rensselaer factories, I am indebted to Messrs. James Kane, and John Reid, of this city; for that concerning the western establishments, to George Huntington, Esq. member of assembly from Oneida county.

† "In 1607, vessels were loaded by miners with a glittering earth dug from a bank of sand near Jamestown (Virginia) which they vainly hoped contained gold." Holmes' American Annals, vol. 1, p. 157. I have called this substance *micaceous sand*, as I am acquainted with no other mineral that answers more nearly to the above description.

order to exalt the other, is a foe to the human race. In him the heart as well as the head must be disordered.

None such are here present. We are united in one common aim of fostering and encouraging whatever may be useful to our country. The situation of *that* country is peculiarly favorable to such exertions. Our horizon though cloudy, is not enveloped in the lurid darkness of the Eastern hemisphere. In one state in Europe, every new invention which substitutes machinery for manual labor, inflames civil discord, while we hail it as a valuable addition to our national riches. In others, the Arts and Sciences are only cultivated that they may be accessary to plans of military despotism, and that contending nations may wield with fiercer destruction the infernal machinery of war. Who from this survey, where the exertions of human intellect appear cursed with unprofitableness, will not turn to his own country, as the last defence and shelter of civilization and human happiness? *Who* will not lend his best aid in conducting her to the summit of national greatness?

ERRATA AND ADDENDA.

Page 15, line 21st, for parts read *part.*

Page 17, note §. In preparing this note, I find that I mistook the name of the inventor. It should have been *Jeremiah Wilkinson*, instead of Josiah Waterman.

Page 22, line 26th, for stills read *kettles.*

Page 24, line 2d, from the bottom, read, From analysis it appears to be quite pure.

Page 28, line 10th.—Sulphuric acid is manufactured at Charlestown, (Mass.) (New-England Journal, vol. 2, p. 190.)

Page 28, line 22d,—Since delivering the address, I have ascercertained that American *Black Lead* is frequently used in the manufacture of pencils. It is made a trade in this state and in Vermont. The pencils appear to be of a good quality.

Page 30.—*Carbonate of Magnesia* is manufactured near New-Bedford, (Mass.) The works are sufficiently extensive to produce from 15 to 20,000 pounds annually, and the article thus made is stated to be superior to the European Magnesia, (New-England Journal, vol. 2, p. 190.)

Page 36, line 16th,—The mineral manufactured into ornaments at Zoblitz, is common serpentine. (Quarterly Review, vol. 2, p. 66.) Kidd was my authority for the former assertion.

Page 37, line 8th, for dying read *drying.*

Page 39, line 14th, for natural read *national.*

Page 39, note ‡—for Oneida (Oneida county) read *Vernon,* (Oneida county.)

AN

EULOGIUM

UPON THE LATE

ROBERT R. LIVINGSTON, L. L. D.

PRESIDENT OF THE SOCIETY

FOR THE

PROMOTION OF USEFUL ARTS.

DELIVERED,

BY APPOINTMENT OF THE SOCIETY,

MARCH 31, 1813,

AT THE CAPITOL, IN THE CITY OF ALBANY.

BY THE REV. TIMOTHY CLOWES,

One of the Counsellors of the Society.

The Society for the Promotion of Useful Arts in the State of New-York, at their meeting on Monday the 3d March, 1813, passed the following resolutions:

RESOLVED, That the Members of the Society for the Promotion of Useful Arts wear the customary badge of mourning on the left arm, for the space of thirty days, as a token of respect for the memory of their deceased President, the Hon. *Robert R. Livingston.*

RESOLVED, That the Rev. Mr. CLOWES be appointed to pronounce an Eulogium before this Society, commemorative of the virtues and talents of their late President, as well as of his patriotic exertions to advance the prosperity of this institution, and of his country.

In obedience to the above appointment, the following was delivered, on Wednesday Evening, the 31st March, 1813, in the Assembly Chamber of the Capitol.

EULOGIUM.

Mr. Vice-President, and Gentlemen of the Society for the Promotion of Useful Arts,

WHEN I undertook to deliver an address commemorative of the public and private virtues of the late Chancellor Livingston, I hardly reflected until it was too late to recede, on the responsibility I had assumed. And now, when I feel that responsibility, in all its extent and weight, I trust I may divest myself of the greater portion of it, by stating, that nothing but your unanimous appointment and repeated solicitations could have induced me to attempt a task to which I honestly deemed myself inadequate. When this public expression of respect was determined on by the Society, I did hope, that some one of its members who had passed through life with the Chancellor, and intimately knew his worth, would have performed this solemn duty. To this end my exertions were first directed, and there is still cause to regret that they did not meet with success.

Any attempt, however humble, to do justice to the memory of the truly great, must ever excite great expectations. I am therefore not surprised to see this large and very respectable audience. But that these expectations, so justly excited from the greatness and worth of him who is the subject of them, will be in any degree satisfied, I have not yet ventured to believe. The enticement of *novelty*, the object of this address does not admit. The public life of a public man must be very generally known, and his private character and pursuits, so far as they are matters of general concern, do not wait to be told in a funeral oration. I know very well that this want of novelty and consequently of interest, might be remedied by imitating the common strain of eulogy, and drawing an imaginary picture of excellence

which never existed, or certainly not in the person whose name it bears. But the advantages resulting from this expedient I shall willingly resign. As far as the short notice I have had to prepare this address will permit, I shall attempt a true and unadorned biography of Chancellor Livingston. That I might be the better able to do this, I have been kindly furnished with such assistance, as leaves me little of the pride of authorship, while it enables me to say, that all the facts I shall state are substantially correct. And however unusual may be the circumstance, I am happy in saying, that in the instance of Chancellor Livingston, true biography and exalted eulogium meet; that a correct account of his life is praise; and such praise as in the present imperfect state of human nature, we are seldom called on to give. That he was perfect is not asserted. Christianity forbids *me* to say, or *you* to believe this of any man. But that he was truly great, and exhibited many eminent virtues; that he early and strenuously asserted the rights and independence of his country; that he ably and ardently served her in many public capacities; that he constantly sought her interests and welfare; that he greatly promoted her prosperity and honor by his improvements in agriculture and inventions in the arts; that as an individual he was kind and benevolent; that he always treated the Christian Religion with the greatest respect and veneration, and finally left his dying declarations and public and solemn testimony in its favor, and departed this transitory state feeling its peace and trusting in its hopes.—This is the outline of the history and the exalted eulogium of Chancellor Livingston.

In our republican country and institutions, it can be of little importance to mention, but yet it may gratify curiosity to be informed, that the family of Livingston is a very ancient and respectable one in Scotland, "distinguished for its numbers, opulence, talents, Christian virtue, and attachment to liberty." In the year 1660, it was enobled by the head of the family receiving the title of Earl of Newburgh,

which of course continues to be the title of some of that name to the present day. That branch of the Livingston family which came over to this country emigrated about 150 years ago.

On their first arrival there were but two heads of families, an uncle and a nephew, from whom have sprung the very numerous descendants of the name of Livingston, who are scattered over the United States. The same public and private virtue which distinguished them in Scotland, followed them to this country. Perhaps there cannot be named a family in America, which has done greater honor to their country than this. To speak of the living worthies, who now support the ancient honor, dignity and virtue of the name of Livingston, and add to their country's glory, would be to sacrifice to heroes before the sun were set, and would offend as much against true delicacy, as against classical propriety—to pass by any notice of these therefore, and to turn our attention to those who now sleep in the dust, we may reckon of this name, some of the greatest and most distinguished men, which our country has yet produced. In Governor Livingston of New-Jersey alone, were combined the poet, the lawyer, the theologian, the patriot, and the Christian; and in him alone might be found a proof, if all others were wanting, that the Atlantic wave does not wash away every particle of genius which distinguished our forefathers; that America is not the Bœotia of the earth; that they who pass from the Eastern to the Western Continent do not leave all wisdom behind them; that wisdom, talents and learning are not to be defined by latitudes and longitudes; that whatever may be said to the contrary by English wits or French theorists,

"*Cœlum, non* animum, *mutant, qui trans mare, currunt.*"

After this notice of *a name*, the pride and the boast of America, and of this state, you will follow me, while I speak of one, who has added new and distinguished honors to *that name*. Robert, the son of Robert Livingston, is numbered with his fathers; and nothing remains to us, but the memo-

ry of his usefulness, his talents and his virtues, which it becomes his country affectionately to cherish. He has himself built his own imperishable monument, and inscribed his epitaph on the pillar of American liberty and independence, in the civil institutions of his native land, in the advancement of agriculture and the arts. In these we may read the works and the character of a true American patriot: by few equalled, by none surpassed.

Robert Robert Livingston, was born in the year 1746.—Providence, who determined that America should be free, ordering the time of his birth, so that the maturity of his mind and the acme of his political talents, should just coincide with the dawn of our liberties, which he was born to cherish. His father for many years previous to the revolution, filled, with great credit to himself, the office of judge of the supreme court. In the earliest part of the dispute between this country and Great Britain, Judge Livingston warmly espoused the cause of America. For this political heterodoxy, he was ejected from office in the year 1775. The *son*, having laid the foundation of his future eminence in literature, science, and the arts, in the college of New-York, was appointed to the office of recorder of that city. This office he held for several years. But adopting the obnoxious political tenets, he was dismissed from office at the same time with his father, by the Royal Governor Tryon. The arbitrary and tyrannical measures of the British parliament against his native country, wedded him firmly to the cause of American liberty and independence. And this devotion to his country's cause, ranked him among the foremost, as his talents placed him among the most influential, in the revolutionary councils.

In the first American congress, which sat at Philadelphia, Robert R. Livingston was a member. He was not a silent or an inefficient member. When the great question of independence was agitated, he exerted his great and distinguished talents in its favor. And when it was determined by the majority of congress, that these states should be free,

he was appointed one of the committee, to draft the *declaration*, which pronounced us for ever absolved from foreign allegiance, and exalted to a name and a place among the nations of the earth.

Returning from this ever memorable congress, Mr. Livingston was called upon to attend the convention of this state, which met at Kingston, in the year 1777. By that body he was appointed the chairman of the committee to draft the constitution of this state; and it is greatly owing to *his* abilities and exertions, that we are indebted for that excellent instrument, which has been the admiration and envy of every other state in the union; and which in some of its most prominent and essential features was imitated by those who drew up the constitution of the United States.

In May of the same year, this state being greatly distracted by the war, and torn by party divisions and animosities, so as to render the meetings of the legislature and the regular administration of justice impossible, *he* was appointed one of the council of safety; in whom were invested all the powers, legislative, judicial and executive, necessary for the preservation and safety of the state, until the government could be again established.

At the same time he was appointed by the convention, the first chancellor of this state; and in this high and responsible office he remained for twenty-five years, when he was called upon to serve the general government in a mission to France.

In the year 1780, Chancellor Livingston, was appointed by congress the secretary of state for foreign affairs; and he executed the duties of that office until the general peace of 1783; continuing the whole time to preside in the high court of this state, over which he had been placed.

In the convention of this state, called in 1788, for the purpose of deliberating on the constitution for the United States, which had been proposed by the general convention of the states at Philadelphia, Chancellor Livingston represented the city and county of New-York. In this convention, he

took a very distinguished and active part. He opened the debates with a most able and eloquent speech, in which he earnestly advocated the ratification of the proposed constitution; and it may be safely asserted, that, had it not been for *his* efforts, united to those of Mr. Hamilton and Mr. Jay, this important state would have withheld its agreement to the present happy constitution of the country. But the mighty efforts and the commanding eloquence of these gentlemen, gained such a powerful ascendancy over the members of this convention, that two-thirds of that body, who had been instructed by their constituents to vote against the constitution, and who came with that purpose, were at the final vote dwindled into a minority; and New-York was the eleventh state, incorporated into the federal union.

The 30th of April, in the succeeding year, is one of the most remarkable epochs of American history. Washington had been unanimously elected to the presidency, and had come to New-York to assume the first office in the gift of his country or the world. And let it not be deemed too trivial a circumstance to be noticed among the great events of the Chancellor's life, that he was called upon on that occasion to administer *the oath*. He stood the minister of our holy religion, to receive the vows of Washington to God and to his country; and when at the conclusion of the solemn ceremony, he pronounced "Long live George Washington," he was the High Priest of America, and the Prophet of God; offering up at the same instant, the united prayer of three millions of people, and declaring an infallible oracle of heaven, "that Washington should for ever live in the hearts of his countrymen."

It was that day, distinguished above every other, by these events which brought the revolution to a close, and established this government on a *solid*, and, until the sins of the people shall undermine it, an imperishable foundation.

From this time, Chancellor Livingston devoted himself to the direction of the court of chancery of this state, the duties of which had now become extremely arduous, and so

numerous as to require almost his whole time. The little leisure he could command was spent in agriculture and in promoting the liberal and useful arts. Of these he was ever passionately fond. After noticing one more prominent part of the Chancellor's public life, we shall recur again to this subject, and shall show, that how much soever this state and the United States are indebted to him for his political services, much more is due to him for his improvements in agriculture and in promoting the arts.

In 1801, Chancellor Livingston, being appointed minister plenipotentiary from the United States to the consular government of France, resigned his office in the court of chancery, which he had held so long, with much credit to himself and the welfare of the state. In a foreign court, he strictly regarded the rights and interests of his government and of his fellow citizens. In his intercourse with the first consul and his ministers, he neither forgot the duty of self-respect, nor the dignity and honor of his country. The most prominent act of Chancellor Livingston's negociation with France, was the purchase of Louisiana, and its annexation to the former territory of the United States. Concerning the expediency of which, very different opinions have been entertained by those best versed in the political affairs of their country. Most undoubtedly it will not be an indifferent event or of trivial consequence to the United States. It will either greatly benefit or greatly injure. The immediate consequences of, and perhaps the principal inducements to the measure were, that it opened by means of the Missisippi, an undisputed outlet to the ocean for the whole of our western states and territories; and that four and an half millions of American property, of which the French had despoiled us, were deducted from the price of the purchased territory and saved to our citizens. The lapse of a few years will probably determine the policy or impolicy of the measure; but should it eventuate in one or the other, the credit or the blame must go to the executive, rather than the minister. The responsibility is on him who lawfully directed, not on him who faithfully executed the measure.

After a residence of four years in France, during which time he had secured the respect and esteem of the learned in that country, Chancellor Livingston returned to the bosom of his native state and family; and declining all public and political concerns, betook himself to the more delightful occupations of his farm, and in promoting the useful arts.

Thus, gentlemen of the society, I have exhibited to you the whole political life of Chancellor Livingston; and you cannot but have seen that in every part of it, he was actuated by the sincerest love of country, and a readiness to obey her commands and serve her interests. From the earliest period of our revolution until the termination of it, he was constantly occupied either in the national or state councils.—After the restoration of peace the court of chancery claimed his time and attention; and after that, the duties of his foreign mission called him from his country and from his friends. A life more constantly or zealously devoted to the state has seldom been known than his; and if public services, ably performed, ever demanded public gratitude, they are his. I neither would offer vain oblations at the tomb of the dead, nor willingly offend the living; but yet I am ready to assert, that after HIM, "who was first in war, first in peace, and first in the hearts of his countrymen," there is none *more* worthy to be *second*, than Chancellor Livingston.

Until I had completed the view of Chancellor Livingston's public life, I purposely reserved any particular notice of him as an agriculturist and promoter of the liberal and useful arts. I come to this part of my subject with peculiar pleasure, as it is most delightful to dwell on that, which will most securely establish his fame to future generations.

It is somewhat remarkable that the greatest men in all ages, who have most essentially served their country, in the field and in council; the most famous poets and the most eloquent orators, have ever exhibited a love for rural occupations. Cicero, a name synonomous with eloquence itself, and the saviour of Rome, declares that "of all profitable pursuits, none is better, none more productive, none more

delightful, none more worthy a freeman, than agriculture." To his Cato he attributes the language and the pursuits of the farm. Cincinnatus was called from the plough to the command of the state, and released from that toil, to the plough he again returned. Virgil has endeared himself to posterity by his invaluable legacy of the Georgicks; and Horace, notwithstanding his favor with the great, cannot forget the more refined pleasures of his Sabine farm. And to balance all antiquity with a single modern, Washington, by whom every greatness was exhibited and every virtue felt, enjoyed no pleasures equal to those he derived from the tillage of the earth.

To the farmer of Mount Vernon, we may now add the farmer of Clermont. Chancellor Livingston always felt the highest pleasure in the pursuits of agriculture. In the most active part of his political life, he still seized some moments for the farm and for the promotion of the arts. As his public cares were gradually laid aside, his active mind was more constantly exercised in these pursuits; till in the evening of his days, they claimed him entirely as their own.

It is impossible in the remaining moments I shall assign to this address, to do full justice to Chancellor Livingston's exertions in these useful pursuits. That he might communicate the results of his observations and experiments and elicit from others their knowledge on these important subjects, he was chiefly instrumental in the establishment of this institution, which now mourns his loss, and at whose command I have the honor to speak his eulogy. This society has now existed for above twenty years, during all which time, he was its president, and its greatest supporter and benefactor. Whether present or absent it was uppermost in his thoughts and received his highest services.— While in Europe, he constantly communicated whatever he thought worthy the attention of the society; when in this country, we were entertained and instructed by his extensive foreign correspondence on every subject relating to the arts or agriculture. They who would know more particu-

larly the extent of our obligations to him, we would refer to our published transactions; at the same time acknowledging yet further obligations, in some essays not yet before the public. In these will be seen a man constantly striving for the general good of mankind; and though as might be expected from one so constantly engaged in useful exertions, he sometimes was mortified by abortive experiments or useless speculations, yet these essays contain a fund of information on agricultural topics, which is not frequently excelled. Of them it may be said as of the Georgicks, that they teach

> "What makes a plenteous harvest, when to turn
> The fruitful soil, and when to sow the corn:
> The care of sheep, of oxen and of kine,
> And how to raise on elms the teeming vine."

His agricultural essays are all of them useful, but those especially which teach, *what make a plenteous harvest* and the *care of sheep*.

To Chancellor Livingston is owing the introduction into this state, and the common use of *gypsum* or plaister of Paris, as a manure. About the year 1789, he began to make experiments on his own farm, and succeeding, he communicated his results to the farmers of the state. And in a few years he had the satisfaction of seeing it generally used. It is this chiefly which has given our state its present primary station among the United States. The lands upon our Hudson river, were fast deteriorating, having been worn out by constant tillage. On this account, the inhabitants of this district of country were fast removing into the more unsettled parts of this state, or more generally into some of the new states. But the seasonable introduction and use of plaister of Paris renewed our worn out lands, and brought them back to more than their original fertility. The depopulation of our state was prevented. Emigrations from other states were made into it; and New-York, which in the year 1790 was only the fourth in population, and in 1800, only the third, at the last census in 1810, was the largest in population of

any in the union. But it not only made our inhabitants numerous, it made them industrious, prosperous and rich.—The *gypsum* was the true philosopher's stone, which had been so long sought for. It turned every thing it touched into gold.

To Chancellor Livingston this state is further indebted for the introduction of the merino breed of sheep, and for the general emulation excited among our farmers, to rear and improve these valuable animals. The introduction of these was a consequence of the Chancellor's mission to France, and must be of the greatest and most decisive advantage to the United States. Already its effects upon our manufactures have been seen. This society have adjudged premiums during their present session, to specimens of cloth, which would vie with the finest foreign textures. This chair, which the feelings of the legislature, have caused to be shrouded in the garments of mourning, laments the loss we have sustained in our own native fabrics.—The most affluent among us now feel proud to wear and to exhibit the fruit of our infant manufactures. The American farmer feels a conscious greatness and independence, when he can appear clad in the vestments wrought by the hands of his sisters or wife or daughters. But above all, the real patriot sees and rejoices that our future dependence on foreign manufactures can be no longer asserted; and that our national wants can be supplied from our own internal resources, whenever the true policy of the government may require the measure. These are the consequences of the introduction of the merino sheep. For ever honored by his country be the man, who obtained the *golden fleece*, and returned with it to our shores; who has declared a second independence for our country.

These are the chief of the *agricultural* improvements which Chancellor Livingston has introduced into our country. There yet remains to be spoken of, an invention in the useful arts of which he was the author and promoter, which in some degree surpasses these; and which alone, deserves

to render his name immortal. It will be readily understood that I allude to the application of steam to impel boats. A work which cost many years of anxious care and study, before it could be brought into successful operation. From the time Chancellor Livingston was convinced of the feasibility of his plan, until he went to France, he was actively engaged in experiments on the subject. In the year 1796, he applied to the legislature of this state for some exclusive privileges in case he should succeed; which that body granted rather to satisfy a meritorious applicant, than expecting his success. From that time the subject of steam boats excited very general ridicule and the Chancellor was looked upon as a visionary projector. Not despairing ultimately of success, he continued his labor during his residence in Paris, and there, after an expense of thousands, produced that wonderful machine, which without wind, without tide, (and frequently in opposition to both) is impelled with a certain and a rapid motion through the waves.

Returning to his country Chancellor Livingston, commenced the building of a steam boat for the purpose of navigating the Hudson river. The incredulity of his fellow citizens was not yet overcome. They thought it the idle *chimæra* of an old man's brain. And if the first steam boat had received the name by which it was most frequently honored, this day *The Chimæra* would have sailed the Hudson; and the Roman poet's description of Gyas' boat of that name, would have been verified in modern times.

Ingentemque Gyas ingenti mole Chimæram, Æn. V. 118.
Urbis opus. (Cæcis) flammisque armata Chimæra,
Effugit ante alios, primisque elabitur undis 151.
Turbam inter fremitumque.

[The reader must excuse the insertion of "flammisque armata Chimæra," from the 288th verse of the 6th book of the Æneid, as with "cæcis," it serves to complete a line and to make up an exact description of a steam boat.]

For want of a better, the following imitation is offered:—

The huge Chimæra skilful *Gyas steers,*
In height, length, breadth *so vast,* that she appears

More like a peopled *city* than a ship;
Nor oars, nor sails this mighty mass equip;
But as the *Stygian monster*, whence her name,
Her inward breast confines *the furious flame.*
Impell'd by this, she scorns the winds and tides,
And *first upon the waves*, she *swiftly glides.*
Thousands astonish'd, see her as she *flies*,
And with their *shouts* they *rend the air and skies.*

Such was the vessel at length produced by the labors of Chancellor Livingston. Such the wonderful structure, the admiration of this country, and the envy of European artists, which now glides upon the waves of the Hudson. A new æra in the history of internal navigation has arrived. Time and tide and wind have little influence upon our journeys. Distant cities and towns approximate to half their former distance.*

It would be doing injustice to the memory of Chancellor Livingston, to omit to mention, that he was the principal founder, and, from the time of its institution till his death,

* Honor to whom honor is due. Perhaps I have gone too far in giving credit to Chancellor Livingston alone, for the invention of steam boats. The world needs much information upon this subject. Mr. Robert Fulton, who was with the Chancellor in France and united with him in his efforts to build steam boats, comes in for a share of what is above given to another. It is impossible to adjust their various merits or to show how far the world is indebted to either in this important invention. It ought to be mentioned, likewise, that other persons claim the honor of this invention. The most prominent of them is Mr. John Fitch, a citizen of New-Jersey, who propelled a boat by steam as early as the year 1787. But this boat was soon laid aside, whether for want of means to put it in full operation, or the failure of the boat to work, I am not able to say. At the time of publishing this address (March 1814) the subject is ably discussed in the legislature of this state, on a question brought up by a petition of Gov. Ogden of New-Jersey. The claims of Fitch and the adverse claims of Livingston and Fulton have each very strong advocates.—But however the question may be determined, the credit due to the subject of this address remains in a very great degree unimpaired.—It is most evident that had it not been for his patient assiduity, and his study and exertions for a great number of years, notwithstanding the ridicule of his countrymen; had it not been for his liberal spirit in making the most expensive experiments, we should not at this day have had a steam boat in our country. With whomsoever the credit may rest of the original invention of steam boats, Chancellor Livingston is entitled to the equal credit of *introducing* them into our country.

was the president of the American Academy of Fine Arts in the city of New-York. That society is indebted to him for some ancient and modern statues of the best masters, which he procured in France and presented to the institution. The Society of the Fine Arts, feeling very sensibly the loss of their late president and founder, have appointed a gentleman* to deliver an address on the subject. To the acknowledged talents of that gentleman we commit the duty of speaking of his services to promote the interests of that valuable institution.

I shall detain my audience but a few moments longer, while I speak of the personal and religious character of the late Chancellor Livingston.

It is here, I most feel how inadequate I am to the task I have undertaken. I had not the happiness of such a personal acquaintance with Chancellor Livingston, as to enable me to speak with any propriety on this subject. I have heard indeed of such instances of his benevolence, and to so great an extent, as to leave little doubt that benevolence was the habit of his soul. Five thousand acres of land to the inhabitants of Kingston, to repair in some measure the loss of their town burnt by the British; several hundred acres given not long since for the support of a church in his neighborhood; a share in one of his steam boats, valued at five hundred dollars, to the Ladies Society of this city; these instances of *extensive* benevolence, accidentally heard of, prove conclusively, that he was kind and benevolent to the needy and distressed among his fellow creatures.

But my inability to speak on this subject as I ought, gives me the liberty of introducing a communication with which I have been honored from one who intimately knew the worth of the late Chancellor Livingston.† I shall not only have the excuse but the thanks of my audience for the introduction of so much eloquence and pious feeling as is here displayed.

"His excellencies in the domestic circle were most con-

* The Hon. De Witt Clinton.
† Mrs. Margaret Tillotson.

spicuous: With wit at will, a lively imagination and brilliant fancy, yet were these in such subjection to the feelings of those he conversed with, that he never tinged the cheek of diffidence, or wounded the bosom even of guilt or folly."—"But distinguished as these qualities made him in life, and endeared him to those who knew him well, yet are these cast in the shade, when we view him in the character of the Christian, professing openly, his faith, his hope and his resignation in all things to the divine will. From the commencement to the end of his illness, he ever gave the fullest and the most unequivocal testimony to the gospel doctrines, hoping for eternal happiness, only through the mediation of Christ's righteousness." "From the earliest stage of his sickness, he predicted the speedy close of his important life; and with the fortitude and calm serenity of a Christian; and during all his conflict, he never uttered a murmur or complaint. On the contrary, he often spoke with cheerful thankfulness of the prosperity he had enjoyed in this life and the numerous blessings with which Providence had surrounded him, and by sometimes repeating the 103d Psalm, he expressed his gratitude to God for all these mercies."

"From this period also he became much abstracted from all temporal cares or occurrences, his previous arrangements making all interest in them unnecessary, his mind being now solely engrossed by subjects more suitable to his present situation and future views as they respected his solemn change. And on these subjects he was both persuasive and eloquent."

"In a conversation with a friend he once observed that he had taken great pleasure in the study of ethics and philosophy, but that he *now* found that the truest philosophy consisted in pardon and peace through a Mediator."—"This peace he enjoyed through the course of his long illness, and so highly did he esteem its heavenly origin, that he described it as "passing all understanding;" nor would he exchange it, he said, for all the health, wealth and honors that time

had or could bestow—it was his support under suffering humanity, and had taken from him all fear of death."

"His natural benevolence was also greatly increased, being much engaged in devising liberal plans to succor and remove the sorrows of poverty and affliction, and while the tear of gratitude bedewed the cheek of the widow and orphan, their silent benediction ascended to heaven for their benefactor, "for to do good and to communicate he forgot not."

"While speech remained he continued to use it for the Christian benefit of those around him, particularly for his near relatives, to whom nature had united him by the dearest cords of love: these ties were *now* soon to be broken, and as his last and best legacy he besought them, to seek religion, through redeeming love, as a source of happiness here, and a foretaste of their better portion in the life to come."

"These were his religious sentiments, and these like the top-stone of a building, will add a grace and a glory to this highly finished character of Christian, friend and patriot."

Thus we behold in Robert R. Livingston, the three high characters of statesman, a promoter of agriculture and the arts, and the Christian. As a statesman, he obtained all that a statesman can reasonably expect, a *present high and honorable fame*. As a promoter of agriculture and the arts, he ardently anticipated the gratitude and the affectionate remembrance of posterity: as a Christian, he died in hope of eternal bliss. And from the whole *we* may learn, that if our only wish is after the mushroom popularity of a day, then politics should be our whole business: If we expect the blessings of succeeding ages, let us be useful to our fellow creatures in all honorable and useful pursuits; and if eternal happiness be our aim, then let us bestow our chief attention to the duties of religion.

AN

ADDRESS

ON THE

BOTANY OF THE UNITED STATES,

DELIVERED BEFORE THE

SOCIETY

FOR THE

PROMOTION OF USEFUL ARTS,

AT THE CAPITOL, IN THE CITY OF ALBANY, ON THE 9TH DAY OF FEBRUARY, 1814.

To which is added,

A CATALOGUE OF PLANTS

INDIGENOUS TO THE STATE OF NEW-YORK.

BY JACOB GREEN, A. M.

One of the Counsellors of the Society, and Member of the Linnæan Society of Philadelphia.

Fortunatus et ille, Deos qui novit agrestes,
Panaq; Sylvanumq; senem, Nymphasque sorores.

Virg.

ON THE

BOTANY OF THE UNITED STATES.

"IN every country an accurate knowledge of its internal resources, forms an object of political importance. But a description of its natural productions is connected with the interest of society at large, and eminently calculated to illustrate those indications of goodness and intelligence, which may be traced in every form of matter, from a particle of earth to the wonderful construction of an organized and sentient being."*

These sentiments should be felt by every well wisher of science; and every enterprising and well disposed citizen, will be willing to contribute, as far as he is able, to the information here contemplated. Under this conviction, I have determined to address you this evening ON THE BOTANY OF THE UNITED STATES. A subject which, considering our peculiar and important advantages for its cultivation, has been, I conceive, much neglected. I propose, first of all, to call your attention to some of the advantages which we possess for the study and improvement of Botany.

A country can scarcely be said to exist till the period of its civilization. The savage, with a mind uninformed by knowledge, and affected by no desires or emotions, but those of immediate preservation and enjoyment, passes, with little regard, the most important productions of nature. Even those which by their novelty or usefulness have engaged his attention to-day, will often be forgotten in the hurry of to-morrow. Of Botany, he knows nothing. He has a slight and imperfect acquaintance only with a few medicinal and

* Edinburgh Review.

nutritive plants, and of these indeed, he has scarcely more knowledge than that which is possessed by his wild associates, the beasts of the forest. Nature to him is a blank—All her endless varieties exist in vain. It is civilization alone which opens the stores and discloses the mysteries of creation, and enables man to appropriate to himself whatever is necessary, useful and ornamental. Till the discovery of America, therefore, by civilized Europe, the advantages of our country for the study of Natural history in general, and of Botany in particular, could not be appreciated. These advantages, I have affirmed, are peculiar and important.—They are so, because in a new country all vegetation, being in its original state, the Botanist is not perplexed in his investigations and discoveries, by those changes in the qualities and the appearance of plants, which the culture and the innovations of art always occasion. Add to this, the important circumstance, that the greater portion of our country is placed in that happy temperature of climate, where vegetation is neither wholly checked by the severity of northern blasts, nor its sources dried up by the too ardent rays of the sun. It is true indeed that hybridous productions are every where to be found,* and that a doubt may be suggested whether all the *species plantarum* are not the effect of changes produced by time; and that the *genera* alone were the immediate productions of the Creator. Be this as it may, it is still certain, that a newly discovered country affords far less varieties of this kind, than are found in regions where the improvements of cultivation have been introduced.

The moisture of the ground and the state of the atmosphere is not so much varied in America by a difference in latitude as in the countries of the old world. From this cause probably we witness that general and remarkable abundance of herbs, shrubs and trees which distinguish the different parts of this continent. There is certainly a lux-

* See Wildenow's Principles of Botany—and also a Dissertation on the Sexes of Plants by Linnæus.

uriance in the vegetation of North and South America which is unequalled by any other portion of the globe. And as one extremity of the United States is influenced by the severity of polar cold and the other powerfully affected by equatorial heat, while the far greater part, as already remarked, is found under temperate latitudes, we should expect what we know to be the fact, that the variety of our plants would be peculiarly great. But that we may the more clearly discover the advantages enjoyed in the United States for the study and improvement of Botany, allow me to present you with a sketch, a little more distinct, of the face of the country, and of its soil and climate; with a cursory notice of some of the plants already known.

That vast chain of mountains which extends in a north and south direction, across the United States, is the most striking feature of the country. This great ridge is intersected by many others, which, though *comparatively* small, are, when separately taken, by no means inconsiderable.—These mountains are generally of the *primitive* formation.

The rivers which descend from these mountains, are another striking characteristic. The St. Lawrence, the Hudson, the Susquehanna, Ohio, and Missisippi; whether we consider the length of their course, or the quantity of their water, may vie with any in the old world.

Our lakes are no less conspicuous and peculiar than our rivers and mountains. Huron and Superior, Ontario and Erie, are without rivals, and almost without resemblance, in any other part of the globe.

Now it is to be remembered that the banks of rivers, the bases of mountains, and the margin of lakes, are always sought after by the Botanist, as particularly favorable to his researches.

The soil at the base of our mountains towards the Atlantic, is generally composed of a rich mould, from two to four feet in depth. Nearer the ocean a clay soil, mixed with loom seems to predominate.*

* Rush's Medical Enquiries and Observations—also Proud's History of Pennsylvania.

That portion of land, which forms the soil of most of the states included between the sea and the ridge of hills which extends westerly from the southern part of the state of New-York, round the rivers Patapsco and James, to the Roanoak in South-Carolina, is generally loose in its texture and rich in its composition. It was perhaps formed later than most of the other country, being in many places manifestly alluvial, from the surrounding heights. This region of ground is intersected by numerous streams of water, on the banks of which a multitude of herbs and shrubs are found, that were thought to grow only in the upland country. In other parts of this tract, plants are seen which were supposed natives only of the southern states. Thus in the lower parts of New-Jersey, Euphorbia Ipecacuanha has lately been discovered.

My purpose does not require a particular description of the nature of the soil in every portion of the country. It is sufficient to state that it is generally fertile.

Take now, in connexion with the statement just made, an extract from Wildenow's Principles of Botany and Vegetable Physiology. "We find (says he) that mountainous countries are richer in plants than flat countries, and that in primitive mountains the number of plants exceeds that of the floetz mountains. A country of primitive rocks has plants, which other mountainous countries do not possess. In all plains of the same latitude, however far they may extend, the same plants always occur; only with some little varieties dependant on difference of soil. In primitive rocks, and at their foot, we again meet with all the plants of flat countries. Whenever primitive rocks surround a flat country, we find all the plants of this at their root, and even at their summits; but after ascending, and descending on their opposite side, we find a different vegetation, which again extends as far as the next mountainous chain. Now, who will doubt that all the plants of flat countries which were found at a later period, came from the high mountains; and that the primitive mountains of our globe, were the chief sources, as it were, of

the floras of the different countries. Hence America is so full of plants, because from the North Pole to the South, high mountaineous chains, with numberless intermediate branches, intersect it. Hence Canada produces different plants from Pennsylvania, this again from Virginia, and this again produces different from Carolina. Hence the North-West coast of North America produces plants which totally differ from those of the North-East coast."*

The influence of mountains, lakes and extensive forests, on the climate of a country, is well ascertained; and since we are peculiar in all these respects, our climate will of course be peculiar also. But it is impracticable to give a description of all the peculiarities of our climate, produced by local circumstances. The general prevalence of cold, however must not be unnoticed. Its power on the Western continent is not confined by the limits of the frigid, or the temperate zone. It even mitigates, by its influence, the excessive heat of the torrid zone. In the same parallels of latitude, on the Eastern continent, winter is scarcely felt, while in America its rigor is extreme. On the contrary, the sultry plains of Asia, and the burning sands of the African desert, have no counterparts in America. Our summer months indeed are frequently warm,† but their warmth, like the cold of winter, is not lasting.‡ This influence of cold on the American continent, with the frequency and violence of our thunder storms, and the sudden change of air after them, may be the causes why we abound more in biennial and perennial plants, than any other part of the globe.

It is at least the general opinion,§ that the weather of the United States is more changeable, and less severe, than formerly; occasioned by the diminution of forests, the draining of swamps, and the improvements of agriculture. If the

* Wildenow's Botany, &c. page 382—the English translation.

† In July 1812, lat. 42 1-2, Far. Thermometer stood at 96°.

‡ See some interesting notices on this subject in vol. 2d of Robertson's History of America, and Pinkerton's Geog.

§ I am well informed that the late Dr. Rittenhouse (a high authority certainly) was decidedly opposed to this opinion.

fact be so, it will have at least a gradual influence on the vegetation of the country.*

As the plants of this country, which are generally known, may be found in catalogues formed on purpose to embrace them, I shall notice them but slightly and imperfectly, in mentioning some vegetable productions for the illustration of the point before us.

The forest trees in North America are almost beyond number. Those which are already arranged and classified, amount to more than one hundred and fifty species, while in all Europe, botanists reckon but forty.† The Chesnut, the Walnut, the Hickory and Gum, here grow to an enormous bulk, and are nearly of every species. The Elm, the Poplar, the Beech, the Maple and the mountain Ash, are very common; and both for size and beauty are no where excelled. Many varieties of the Oak are here profusely planted by the hand of nature. Our sandy tracts, unlike the wastes of Zaara or Arabia, are quite productive. Here flourishes the Pine in all its varieties, the Hemlock, Spruce and Juniper, the Cedar, the Fir, and a species of the Larch.

Among the smaller plants may be found the Geranium, Ceanthus, Gulthæria procumbens, Monarda, Cunilla and Solidago Odoria, most of which are frequently substituted for tea. The Lobelia cardinalis, the Aster, Syringa, and many beautiful species of the Lonicera or Honeysuckle, which spread their flowery garlands from tree to tree.—The Phleum, Avena Elatior, Myosotis, Sinosurus, Aira, Briza, Draba, and the far famed Agrostis—The Galium, the Sanguisorba, the Quercitron Oak, the Sophora, and the Rhus Toxicodendron, may be mentioned as some of our vegetable dyes.

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* The number of swamps in the United States, and which frequently occupy a large and valuable extent of country, might easily be converted into productive soil, by strewing lime over them—The putrid effluvia which they exhale is destroyed by this process, and the decaying vegetable matter, is reduced to a solid fertile mould. Linnæus first suggested this plan, and in England many of the fens and bogs are made to yield abundantly. The practice is the *liming of swamps*.

† Michaux—Med. Repos.

In the Southern States we find the lofty Palmetto, the Papaw Fig, the great Magnolia, and the Mangrove tree, the only shrubby plant that can flourish in salt water.

Mr. Pinkerton, when speaking of the Botany of this country, observes perhaps with more elegance than correctness, that "the glories of the American Flora are principally confined to Virginia and the Southern States. It is here that the unfading verdure of the wide savannas, the solemn magnificence of primeval forests, and the wild luxuriance of the steaming swamps, offer to the astonished admiration of the Botanist, every thing that by colour, by fragrance, or by form, can delight the senses or fix the attention." In this part of the country on the level of plains by the sides of the rivers, grow "the Magnolia glauca or Beaver tree, American Olive, and Gordonia Lasianthus, silvered over with fragrant blossoms, with numerous species of Azalias, Kalmias, Rhododendrons, arranged by the hand of nature into thickets and shrubberies, entwined and overarched by the crimson Granadillas and the fantastic Clitoria, here display their inimitable beauties in full perfection. The sides of the pools and the shallow plashes, are adorned by the bright cœrulian flowers of the Axia, the golden blossoms of the Canna Lutea or the rosy tufts of the Hydrangia, while the edges of the groves and the dubious boundaries of the savannas, rising imperceptibly towards the forests, are fringed by innumerable gay varieties of the Phlox, by the shrinking Sensitive plant, the irritable Dionæa, the glowing Amarillis Atamasco and the impenetrable ranks of the Royal Palmetto.

The Botanist will find that many of the plants mentioned by this florid writer, are met with in most of the other states.

Our mountainous ridges and our sea coast, are very prolific in Cryptogamic vegetables. The Equisinum, the Osmunda, Polypodium, Adianthum, Onoclea and Bryum, are some of the ferns and mosses. The Lichen, Tremella, with many species of Jungermania and Marchantia, are the sea weeds or Algæ, and the Boletus, Clavaria, and Lycoperdon, are the Mushrooms or Fungi.

But in addition to advantages which are peculiarly our own, we have many in common with Europe. The affinity, in some particulars of our climates, to those of Europe, gives us most of their productions. It is owing, indeed, to this circumstance, and to the easy and continual intercourse between the two continents, that it is sometimes difficult to distinguish those plants, which are indigenous to our soil, from those which are only naturalized, and which grow spontaneously after their adoption. The fact is worth observation, that some vegetables grow with more luxuriance, and arrive at a greater apparent perfection, when removed to a soil and climate, differing considerably from that in which they were formed in their native state. Thus the potatoe (Solanum tuberosum) in the year 1565, was first introduced from this country into Ireland, and thence, by a fortunate shipwreck, into Lancashire in England, in both of which places it thrives better than in America.* If the agriculturist would take advantage of such facts, many articles which at present are imported might probably be made staple commodities.

Having now pointed your attention to some of the peculiar advantages which we possess for botanical enquiries and improvements, and noticed a little, the variety and abundance of our vegetable productions, the remainder of this address will be employed in remarks, more appropriate to this occasion: on a number of plants in our country, which claim particular attention from the agriculturist, the manufacturer, the artist, and the physician. And you will please to remember that as practical utility, more than recondite science, is the leading object of our society, I ought not to hesitate to throw out a number of observations, and to indulge in some diffuseness, which might otherwise be improper.

As there are are many vegetable productions, which seem

* Those who wish to investigate this subject will find much information in the Medical Repository, and in Dr. Muhlenberg's communication to the American Philosophical Society.

naturally adapted to our country, and which have as yet received but little attention, the labour of the farmer would certainly be employed to the best advantage in the cultivation of them. Of these I shall notice a few.

The Sinapis or Mustard is a plant, which might yield no trifling profit to the American cultivator. Small clusters of it are seen growing in our fields and gardens; but whether it is a native of the country, or merely the fruit of chance, I am not able to determine. In some catalogues, however, it is marked as an exotic; but our climate is congenial to its habit, and almost every soil is adapted to its growth. A gentleman from Orange county, in this state, has informed me, that he collected from half an acre of but tolerable land, fourteen bushels of the seed, which he believed equal in quality to that of the Sinapis Arvensis, commonly known by the name of Durham mustard. There are many species of this herb, but it would be well for the cultivator to confine his attention to the one just mentioned, the seed of which is more abundant and of a better quality than in the other kinds. The high price given for imported mustard, and the facility with which it can be raised, induce a belief that farmers generally might find their account in making it an article of culture and traffic.

The curious and beautiful Candle Berry Myrtle (Myrica Cærifera) is very abundant in many parts of the United States. The wax which this tree yields would amply compensate the trouble of obtaining it. In Maryland, on the shores of the Chesapeake, and near most of the streams which flow into that bay, it is found in large quantities. It is also scattered over this state growing in a wet soil, and very rarely exceeding five or six feet in height. The plant, however, is not confined to marshy grounds. I have seen it on upland in Connecticut, rising to the height of 10 or 12 feet. This species indeed is rarely seen, and the berries are not so abundant in this as in the other kinds.* In Louisiana there

* I rather think the Connecticut Myrtle wax tree is only a variety of the species which is found in a wet soil.

is another species of this tree as large as the Cherry, bearing pointed leaves* (Myrica Cærifera Angustifolia); those of the other being broader and more obtuse (Myrica Cærifera Latifolia.)† In France the Myrtle is cultivated for its wax,‡ which is prepared by simply boiling the berries in water; the wax rising to the top of the vessel. It is apt to be of a pale green colour, which is not reckoned handsome. This however may probably be remedied by throwing some alkali into the boiling water, which will convert the wax into a deep green. The experiment indeed I have not attempted, but there can be no doubt of its success. By chemical agents it is probable that almost any colour may be given to this wax. From four pounds of the berries, one pound of wax is obtained, superior in quality, and applicable to all the purposes of bee's wax. Candles made of it afford a clear white flame; and if burned newly made, they emit an agreeable, and it is said a salubrious odour.—Should the Myrtle wax excite proper attention it might be highly advantageous to medicine as well as to the arts.§

The Papaver or Poppy¶ for the variety of its species and the richness of its colours is not exceeded by any of the garden flowers. The petals both of the single and double kind are ornamented with every shade of crimson, yellow and purple; and hence we find it prized in this country more for its beauty than its inherent virtues. It begins however to receive some attention for its medicinal qualities in many parts of the country—In our neighborhood, at

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* Medical Repos. vol. 12, p. 191.

† Two varieties of this tree are found at the Cape of Good Hope. Barrow's Tour in Africa, p. 18, Am. ed.

‡ Medical Repos. vol. 12, p. 192.

§ For the medicinal qualities of the Myrtle wax, see Barton's Collections, part 2, p. 4—and for experiments on its analysis, Dr. Bostick's Memoir in Nicholson's Journal, March, 1803—and for the mode of propagating the tree and manufacturing the wax, C. L. Cadet's Account, Nicholson's Jour. vol. 4th.

¶ This article might perhaps with more propriety be inserted in the list of medical plants, but as an important agricultural object I have thought proper to place it here.

Niskeuna and Lebanon, the Society of Shakers raise the Papaver Somniferum; and they have supplied this city, for a short time, with opium, some of which was little inferior in quality to that imported from the Levant or the East-Indies. Dr. Rickertson, of Dutchess county in this state, also cultivated the Poppy to advantage. From one plant he procured seven grains of opium. A particular account of his success will be found in the first volume of our Transactions.* As far north as New-Hampshire, Dr. Spalding, prepared this gum from the true Opium Poppy (Papaver Album) and also from the common Poppy of the garden.† These experiments are sufficient to prove the readiness with which this plant may be raised, in almost any part of the country, and the valuable addition it would make to our domestic resources will not be questioned.

Opium, which is the inspissated juice of the Poppy, is gathered from the capsules, before, or at the time they are fully ripe, by making four or five longitudinal incisions in them, from the stalk of the plant upwards—Care must be taken not to penetrate the cavity of the seed vessels.—Opium may also be obtained by pounding the dried leaves, stems and capsules, boiling them, when pulverised, in water, and then evaporating and cleansing the mixture.‡

Opium has also been extracted from the common Lettuce, (Lactuca Sativa) simply by evaporating the juice of the plant. Eight heads of full grown Lettuce yielded, in one instance, seven drachms of Opium. Hops also contain a large quantity of the narcotic principle, and the extract of Hops is now in use in some places as an anodyne. Indeed we abound in every species of anodyne plants, and the country physician, with a little care, might supply himself with opiates from his own garden.

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* Agricultural Transactions, vol. 1st, p. 264.

† Med. Repos. vol. 13, p. 193. Archives, vol. 2. p. 177.

‡ For a particular account of this method of extracting Opium see Archives of Knowledge, vol. 2nd, page 169.

But I must observe that the Opium of the Poppy is not the only benefit which its cultivation would afford—From the seeds an oil may be extracted as salubrious and agreeable as the finest Florence oil—The quantity of this oil which is consumed, and the frequent difficulties which attend its importation, would make the extraction of it from the Poppy a lucrative employment.* I am glad to state that in Pennsylvania some acres of ground are planted with the Poppy for this purpose. As the quality of the Olive oil is much affected by the acidity or richness of the soil in which the plant grows, it would be well to notice these circumstances in the cultivation of the Papaver.† It is hardly necessary to add that the opium and the oil may both be extracted from the same plant.

Large quantities of Sugar are annually extracted from the Maple tree, (Acer Sacharinum) in many parts of the United States; and the subject has already received the attention of some writers.‡ I shall therefore in this place notice only the Sugar Cane, (Sacharum Officinarum) this was

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* There have been many doubts suggested respecting the wholesome qualities of this oil---but the question that it is not deleterious is now settled---See the Abbe Rosier's experiments, quoted in Archives, vol. 2, p. 176.

† At Harmony, half a day's ride from Pittsburgh, (both places objects of very great interest) the settlers, use oil expressed from the poppy seed, exclusively, in lieu of olive oil for sallads, &c. It is nearly, if not quite equally good. This oil is becoming common in Europe as a substitute for olive oil. The poppy seed, may be eaten with impunity when ripe. I do not see why its use should be confined to the settlement of Harmony. The Ben, Bene, or Benni Seed common in the Carolinas, can furnish, as I am informed, oil enough to supply the United States at a cheap rate I have eaten the oil of the Ben or Behen nut in England, and I find no difference between it, and the olive oil. Why should this last be imported? But I doubt whether the Ben or Behen nut be the same with the Benni seed. I suspect this last to be the *Sesamum*; but I have never seen it. The Behen nut, *Glans unguentarius, Balenos murepsiki*, is the fruit of the *Gnilandina Moringa*. The oil is prepared in the Levant, in Egypt, in Syria, and in Italy, by expression. It is valuable for its purity, and its freedom from smell and taste, and for its property of remaining long without alteration or rancidity, which makes it extremely valuable in pharmaceutical preparations. *Rees' Encyclopædia.*

‡ See American Philo. Trans. for an important paper on the Maple tree—By Dr. B. Rush.

introduced into Georgia a few years since and has been found to grow there in great perfection.* The sacharine matter of the Georgia cane is quite as rich and plentiful as that from the cane of the West-Indies. It is supposed that most of the land in that state near the coast, south of Sunbury, may be converted into sugar plantations; and since it is pretty well ascertained that more cotton is raised than the manufactories of that article consume, the sugar cane might be advantageously substituted for it.† The interests of humanity, however, would not be advanced by the exchange, as they employ more slaves to make the sugar than to cultivate the cotton.

The Fiorin Grass, or Agrostis Stolonifera, is a native of the United States.‡ Our fellow member, Charles Whitlow, first discovered it in Sussex county, New-Jersey, and afterwards on the margin of the Genesee river—It grows also in great profusion on the island below this city.§ Dr. Mease mentions that he found it on the commons of Philadelphia. This I believe to be incorrect. It is the Agrostis Capillaris,¶ and not the Stolonifera, which is seen in that place.

The Fiorin Grass has excited much attention in this country, since the introduction of Merino Sheep; these animals being remarkably fond of it, and the grass, from its succulent qualities, being well adapted for their fodder—Indeed most cattle prefer it as food to the other grasses; and it is particularly proper for cows, as it is said to increase the quantity and to improve the quality of their milk.

The advantages in agriculture of the Agrostis are of no

* Medical Repos. vol. 12, p. 192.

† Dr. Mease recommends the raising of the papaver in room of the cotton.

‡ There are six species of the Agrostis mentioned by Dr. Muhlenberg as natives of this country, two of these are new species—the Capillaris is among the number but not the Stolonifera—See Muhlenberg's Floræ Lancastriensis in American Philoso. Trans. vol. 3, p. 160.

§ On this island is found the Avena elatior and in the small compass of 6 feet I have seen 6 or 8 different species of grass.

¶ Archives of Useful Knowledge, vol. 2, p. 278.

recent date. There is a species of it called Durva, growing in the North of India, which for a long time has been very greatly prized. Sir William Jones in his catalogue of Indian plants, when speaking of this, observes " its flowers in their perfect state are among the loveliest objects in the vegetable world, and appear through a lens like minute rubies and emeralds, in constant motion from the least breath of air—It is the sweetest and most nutritious pasture for cattle, and its usefulness, added to its beauty, induced the Hindus in their earliest ages, to believe it the mansion of a benevolent nymph. Even the Veda (or holy and immortal book) celebrates it in the following text from the Athervana.* " May Durva which rose from the water of life, which has a hundred roots and a hundred stems, efface a hundred of my sins and prolong my existence on earth a hundred years."†

Among the many superior qualities of the Fiorin Grass are the following—Its active principle of life, which is not destroyed by the operations of nature fatal to other grasses —It thrives equally well in a moist, a dry, and a shallow soil—It appears little affected by the influence of the sun—Hence it may be found growing near the north side of a wall—It is regardless alike of the severe cold of winter, and the intense heat of summer—Its crops are enormous and double, both crops, in one instance, amounted to nearly eight tons and a half per acre,‡ and in another ten tons were gathered.§

The propagation, culture and properties of the Fiorin Grass have been unhappily exaggerated by the lovers of new improvements; who, not satisfied with advantages which are really peculiar, attribute to this herb every fancied desideratum—Yet, after making sufficient allowances on this score, the Fiorin Grass has unquestionably many

* The fourth great division of the Veda.
† Quarterly Review, vol. 1st, p. 307.
‡ Archives of Knowledge, vol. 2, p. 273.
§ See Edinburgh Farmer's Magazine.

excellencies, which ought to give it the highest standing in this class of vegetables.

The sea weeds which are seen in such quantities along our coasts, might be turned to great account; and this portion of our territory which has been resigned to *hopeless sterility*, may thus be rendered productive.* Every rock and island near the Atlantic is covered with the Cryptogamia Algæ, which by calcination is converted into kelp a salt esteemed at a much higher rate than the pearl ash in its purest form.† Kelp is employed in the manufacture of glass, alum and hard soap. The only use made of the sea weed at present is for manure, which is scattered loosely over the ground, just in the state in which it is taken from the sea shore after a storm.

Barrilla which is made in the same manner as kelp, and employed for the same purposes, is procured from the Cryptogamia Filices or ferns, which grow not only along the coast but in the upland country. The state of New-Jersey is noted for the production of them.

Kelp and Barrilla are made by burning the plants in kilns, so that no air can approach them during their calcination.‡ It is somewhat singular that these articles have not been made the subject of commerce by the enterprising people of New-England.

The Urtica Whitlowi, discovered in the year 1810, by Mr. Whitlow, promises to be a better and more lucrative production than hemp or flax. Dr. Muhlenberg gave this important plant its present name in compliment to the discoverer. It is found in great abundance on the island below this city—a place perhaps more fertile in plants, than any other, of equal dimensions, in the United States.

The fact is now well established, that the culture of hemp offers a greater profit to the farmer, than if he should employ his time, his labour, and his field in any other manner

* See National Arithmetic, or Observations on the Finances of Massachusetts, chap. 5th.

† Tucker on Commerce.

‡ Chambers on Glass and Soap Making.

heretofore known—but if the Urtica has a finer and stronger fibre, and will produce more on a given portion of land, it will eventually supercede the hemp.

The soil best adapted to the Urtica is wet meadow land; and it will thrive in ground covered with water many months in the year. It grows also to advantage in a rich, moist, upland loom. It can be raised from the seed or root, as it is a hardy perennial. The seed should be planted in the spring, and the roots in the fall months. If the fibre is wanted for the finest fabrics, the plant should be cut while in full flower; but if only for common use, it will yield more by standing till completely ripe. After being cradled, which is the most proper way to cut it, the stalk should be suffered to lie on the ground some days, as the stinging quality which is peculiar to the growing nettle, is thus removed. The Urtica is rotted in the same manner as hemp, only it requires a longer time for the purpose: But it is not affected by the inclemency of the weather.

The legislature of this state at their last session incorporated a company for the manufacture of this plant, and the United States have granted a patent to Mr. Whitlow for its discovery.*

While on the subject of vegetable fibre, it is proper to mention the Asclepias† and the Apocynum Cannabinum, both of which grow very luxuriantly on the island in our neighborhood, already mentioned. The fibres of these plants are very strong and very numerous; and may, with little trouble, be converted to many domestic purposes. For coarse cordage or family cloth it can be used almost in the state in which it is taken from the stalk. The common Asclepias, or Milkweed, may be employed for

* For many interesting particulars respecting the cultivation of this valuable nettle, examine a paper published by the corporation of the city of New-York, and the Baltimore Medical and Philosophical Lyceum.

† Two new species of Asclepias were discovered in this state last summer by Mr. Whitlow, and a patent has been taken from the office for the manufacture of the staple.

the purposes just mentioned; but there is a newly discovered species having much smaller leaves than the other, and growing nearly in the same plenty, which will be found to answer better.* The silk or cotton taken from the pods of the Asclepias when ripe, has been manufactured into hats, and has also been spun into yarn of which cloth has been made, which vies with silk in lustre.†

The advantages of introducing into this country the cultivation of the Vine have been frequently and strikingly exhibited. I shall only mention that a colony of enterprising Swiss, who settled in the Indiana Territory, have planted vineyards of the Bordeaux, Madeira and other grapes; and they have sent from their wine presses last season large quantities of claret, not inferior to that imported from France. By an advertisement in a newspaper published at Cincinnati, in the state of Ohio, it appears that a merchant of that place has a large supply of this red wine for sale; and that a quantity of Madeira is expected from the vineyards to which I have referred.‡ §

Though not critically proper in a discussion on botany, I may be allowed the liberty of introducing in this place a few observations on some colouring vegetables. The late discovery of the Zanthorrhiza tinctoria in the United States promises to be extensively useful. This shrub is found on the Alleghany ridge from Virginia to Georgia, and it probably may be found on most of the upland country. The extract or even decoction of the whole plant, forms a fine yellow dye, which may be varied by saturation or dilution, from the brightest straw colour to the deepest orange. In combination with indigo or most other blues, all the different shades of green may be produced. The stain which it makes on cloth is not apt to fade or wear off, and it may

* This Asclepias has been sent to Dr. Muhlenberg for a name.

† In France this cotton is known by the name of Virginia silk, and coverlets, stockings and gloves are made of it.

‡ See Columbian, by Albany Register, July 18th, 1813.

§ A new species of cluster gooseberry grows on the Alleghany ridge, which yields a wine nearly equal to that from the grape.

also be applied without using any mordant. Specimens of cloth dyed with the Zanthorrhiza were shewn to the society last winter. This plant also possesses many medical virtues.*

Isatis Tinctoria, or Woad, is well known as a blue, and still better as the basis of black. The colouring matter is obtained from the leaves. This plant can be raised here with little trouble, and in great abundance. In the neighborhood of this city there are some fields planted with it. The Isatis, in conjunction with the Zanthorrhiza, gives us the three principal dyes in colour making.

The Galium Tinctorium is also one of our native plants. It flourishes most in places sheltered from the sun, and where the ground is rather moist. This plant so nearly resembles the Madder (Rubia Tinctorium) in its botanical character, as well as in its colouring properties, that some writers have given it the name of Rubia Americana. The Galium is employed by the inhabitants of Jura, one of the Hebrides,† as a red dye, and it is perhaps equal to the rich red of the Rubia itself. Upon turning over the pages of our transactions, I find that the Galium has already received your attention and patronage.‡ The true Rubia was raised last summer at Pittsfield by Mr. E. Watson, who will, I understand, read you in the course of the winter a paper on this article. The Rubia has for a long time been raised in Connecticut, but only in gardens. I understand the Shakers have also planted it.§

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* See Barton's Collections, part 2, ps. 11, 12, and 13.

† Encyclopædia Britannica, article Jura.

‡ Agricultural Trans. vol. 1st, p. 367.

§ The following directions for raising Madder, may be useful, they are copied from the Emporium of Arts, vol. 4th, No. 2, p. 325.

" This plant may be propogated either by offsets or seeds; if the latter method is preferred, the seed should be of the true Turkish kind, which is called *lizari* in the Levant. On a light thin soil the culture cannot be carried on to any degree of profit, that soil in which the plant delights is a rich sandy loam, being

The Cochineal plant (Cactus Cochinelifer) has been discovered in South-Carolina, where it can be cultivated to any extent. We may therefore reasonably hope that the invaluable dye extracted from the insect which gives this plant its name, and which always accompanies it, will speedily be numbered among our staple productions.†

The juice of the common Pokeberry (Phytolacca Decandra) has lately been added to the list of permanent vegetable dyes. Dr. Adam Seybert of Philadelphia, was the first who succeeded in fixing this colour, which can be changed from the brightest crimson to a red little inferior to scarlet. It is expected from the further discoveries which are likely

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three feet or more in depth. The ground being first made smooth is divided into beds four feet wide, with alternate alleys, half as wide again as the beds; the reason of this extraordinary breadth of the alleys will appear presently. In each alley is to be a shallow channel for the convenience of irrigating the whole field, &c. that part of the alley which is not otherwise occupied may be sown with legumes.

"The Madder seed is sown broad cast in the proportion of from 25 to 30 lbs. per acre, about the end of April. In a fortnight or three weeks the young plants begin to appear, and from this time to the month of September, care must be taken to keep the ground well watered and free from weeds; if the plants are examined in autumn they will be found surrounded with small yellow offsets, at the depth of two inches; and early in September the earth from the alleys is to be dug out, and laid over the plants of madder to the heights of two or three feet, with this the first year's operation finishes. The second year's work begins in May, with giving the beds a thorough weeding, and care must be taken to supply them with plenty of water during the summer; in September the first crop of seed will be ripe, at which time the stems of the plants may be mown down, and the roots covered a few inches with earth taken as before out of the alleys. The weeding should take place as early as possible in the spring of the third year, and the crop, instead of being left for seed, may be cut three times during summer for green fodder, all kinds of cattle being remarkably fond of it. In October the roots are taken up, the offsets carefully separated and immediately used to form a new plantation, and the roots, after being dried, are sold, either without further preparation, or ground to a coarse powder and sprinkled with an alkaline ley. The roots lose four-fifths of their weight in drying, and the produce of an acre is about two thousand pounds weight of dry saleable madder."

† Archives of Knowl. vol. 1st, 257.

to be made on this colour, that the Cochineal which is so expensive, may be generally dispensed with.*

The Quercitron, a species of Oak, and native of this country only, has long been esteemed for producing a yellow dye. Dr. Bancroft, who first carried it to Europe, received a patent from the English government for its introduction there, and acquired a large fortune by the enterprise. The pulverised bark was the state in which the Quercitron was imported and used—But works are now erected at Fitchburgh, in Massachusetts, for obtaining the extract of the Quercitron, by a new process; which contains the virtues of the bark in substance in a very condensed state. One pound of this extract affords as much colouring matter as fifteen or twenty pounds of the pulverised bark.†

As we abound in Cryptogamic plants, I must not pass them wholly unnoticed when speaking of dyes. Both mosses and mushrooms have been made to produce, in union with other substances, beautiful colours of red and of violet hues. In Sweden they stain woollen cloth with their mosses.‡ In France the mountains of Auvergne supply a moss containing a colour little inferior to the splendid purple extracted from the Archil or Roella of the Canary Islands;§ and in the Highlands¶ of Scotland there are mosses found which yield the same beautiful tinctures. These examples ought to stimulate us to inquiries and investigations on these subjects, which probably would be rewarded with complete success.

The art of dyeing is in its second infancy; but we may hope that, like the fabled eagle of the ancients, this renewed youth will be only the precursor of a more vigorous maturity. The attention of a few scientific men to the subject would bid fair to realize the prospect. The ancients held

* See Aurora, October 5th, 1813.
† See Literary and Philos. Repos. for Nov. and Decem. 1812, p. 148.
‡ Kalm.
§ Encyclop. Britannica—Archil and Colour making, No. 49.
¶ Ibid. with Archil.

this art in the greatest estimation, and it is to be lamented that although we have increased the variety of colours, we are yet unable to give them that durability which they are known to have once possessed, and which forms their principal value. The mode of making the Tyrian dye or ancient royal purple, has been long lost. But if the cloth coloured by it could have been preserved, and what is told of it be true, the stain might have been as lasting as the story of its discovery.

The medicinal qualities of plants is an important and interesting subject of investigation, and it is surprising that the spirit of research and discovery, so remarkable in our countrymen, should not have been more operative on this subject. The flower which is now heedlessly trampled under foot, may possess virtues for the relief of many maladies, which, from our ignorance of its properties, we are unable to cure :—And when it is recollected that plants which differ widely from each other in habits of life, and in internal structure, have been found to produce the same results,* it may be confidently expected that a period will arrive when our own country will furnish us, with most of the medicines which are now imported. Already many plants which were noticed as desiderata for American cultivation, and† which twenty years ago were esteemed exotics, are now found growing in our fields and forests. The new and rapid improvements which are making in the Materia Medica, flatter us with a hope that Pharmacy will soon banish from her list, most of her mineral applications, those banes, too often, of the health and constitution, which like the Vampyres of Java, eventually destroy the blood, while they lull, in present security, the unsuspecting victim.

In this place I shall mention a few native medicinal plants, some of which have not been publicly noticed.

The Aristolochia Serpentaria, or Virginia Snake Root, to-

* Homberg produced the same principle from Cabbage as from Hemlock. Edin. Rev. No. 13.

† American Philos. Trans. vol. p. 325 to 380.

gether with many of the same species, have been long known among us as astringents and tonics. But a new plant, which may be called Serpentaria Alba, or white Snake Root, is much to be preferred to the others; as it possesses all their virtues in the highest degree. The farmers of New-Jersey esteem it greatly as a cure for the ague; and it abounds most in the vicinity of marshes, where the miasma which occasions this complaint prevails. But it is remarkable that a dry soil is required for its peculiar habit. The efficacy of the Serpentaria is said to be superior to the Cinchona, or Peruvian Bark in its febrifuge qualities. I cannot forbear just to notice here a witticism on this subject by Voltaire, whose reputation stands higher in matters of fancy, than in matters of fact, and who is commonly unhappy when he touches on a moral subject. He takes occasion in speaking of the Peruvian bark, to combat the idea that the bounty of Providence is apparent in providing a remedy for diseases in the neighborhoods which produce them. He observes, in his Philosophical Dictionary, that the Peruvian Bark is found, in one quarter of the globe, while the disease which it cures is discovered in another. But as the bark is used in many complaints, his remark is wholly irrelavent, unless he could have shewn that it was of no special benefit where discovered. Now if general and uncontradicted tradition is to be believed, the medical qualities of the Cinchona were first learned by observing certain animals, affected by intermittents, instinctively led to the plant itself, or to ponds of water impregnated with its juice.* Be this however as it may, we certainly find in the Serpentaria a new proof of the old doctrine, that the remedy is usually found on the spot which produces the disease.

The Maculata Virginiensis, a newly discovered plant, has been found a most efficacious remedy in epileptic affections, and for this purpose it is much employed by the Indians.

The Maranta Arundinacea, or Arrow Root, (called so by

* Darwin's Botanic Garden, P. 2, p. 60.

the Indians, who heal with its juice wounds inflicted by poisonous arrows) was formerly thought a native only of South America. But it is now discovered in the West-Indies and I believe in Georgia. It is highly valued as an antidote to animal poison. The bite of the Scolopendra or Centum Pes, which is almost as venomous as the sting of a scorpion, has often been cured by the application of the Maranta, which flourishes most where these noxious insects abound. It also effectually counteracts the fatal effects of the deadly nightshade (Atropa Belladona) which is perhaps the most powerful of the vegetable venoms. Six slaves in the West Indies swallowed some spirits from a bottle which had been stopped with the leaves of the deadly nightshade.—Four of them died shortly after, by the effects of the poison. The remaining two were saved by applying liberally the juice of the Maranta Arundinacea. The efficacy of this plant in removing the baneful consequences of the animal and vegetable poison, seems to indicate that the malignancy of mineral poison might also be opposed by its administration. The experiment is certainly worth a trial. The juice of the young plant is the antidote. The ferenaceous qualities of the arrow root when mature, are sufficiently known.

The bark of the White Walnut, or Butternut, has been used for the cure of bites from venomous serpents;* and an extract from it, made by simple boiling, is known to be among the best cathartic medicines. The Scutellaria, or Skull Cap, has lately obtained much reputation as a remedy, or preventure, of cannine madness. The authority on which many of the cures are believed to be real, cannot be questioned; and the frequent occurrence of the hydrophobia, during the summer months, entitle such a specific to much attention—The Sutellaria grows plentifully in this state, and it flowers in July and August.

The Seneka snake root (Polygala Senega) is found in the

*Barton's Collec. vol. 2, p. 23.

highlands between this place and Schoharie. The Indians are said to cure the bite of the Rattlesnake with this root, and they were perhaps first induced to use it, by the striking resemblance which it bears to the rattles of this dreadful animal. There is a great demand for it in medicine, and its discovery in our neighbourhood will be important.

The Delphinium Consolida, or common Larkspur, has been found to possess many useful qualities, and it may be used in some instances for the Digitalis Purpuria, or Foxglove,* a medicine in some cases indispensable; and the effects of which notwithstanding, on the vision, are equally distressing and wonderful. The imagination of the patient, also, both in his sleeping and wakeful hours, is powerfully affected by it.

> The headlong precipice that thwarts *the* flight,
> The trackless desert, the cold starless night,
> And stern-eyed *Murder* with his knife behind,
> In dread succession agonize the mind.

To relieve us from these consequences of the Digitalis, we have a hope in the Delphinium. A tincture made of the bruised seeds has been the mode of its preparation.†

The Columbo root was discovered in the western part of this state last summer, by Mr. Whitlow. Willdenow supposes it to belong to a species of the Bryonia. This however is doubtful. A technical name, it is known, will shortly be given to the plant. Its present appellation is from Columbo, a town in Ceylon from whence all India is supplied. It grows also in Africa,‡ and forms an important article of commerce with the Portuguese at Mozambique. Its use and importance in medicine is fully established, and it has hitherto been the subject of regret, that the irregularity attending its importation, has obliged practitioners often to exhibit it in a decayed state, owing to long keeping.

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* See Medical Repos. Hex. III, vol. 2, p. 232, for a particular account of this important plant.

† See Dr. A. Blanchard's communication to the New-England Med. and Surg. Journal, vol. 2, p. 248.

‡ Duncan's Dispensatory, p. 203.

The Actæa Spicata, marked as peculiar to Britain in Donn's Catalogue, is found at the base of Schooley's mountain, and in many other places. The Actæa Racemosa and Alba are frequently met with. The berries of the Actæa Spicata are poisonous. Toads are said to resort to this plant, owing to some congenial effluvia they exhale from it. The vulgar antipathy to these animals may have arisen from this circumstance. The root of Actæa is the medicine.*

This short list of medicinal plants might be greatly enlarged; but neither the limits nor the design of this address permit me farther to expatiate. I understand that Mr. Frederick Pursh, the botanist, who made one of the expedition up the Missouri under the command of the unfortunate Lewis, is about publishing in London, under a liberal patronage, a full account of the valuable and extensive additions which were then made to the Materia Medica. Another work, comprising the discoveries since that period, is contemplated in this country. These, with Dr. Barton's Collections, will furnish us with a tolerable view of the subject.

Respecting ornamental flowers, the properties of which have not yet been developed, I shall only say, that the florist would find, in many of our wild plants, colours richer and more numerous, and fragrance more delightful, than in many which have already been introduced into the hot house and garden.

I conclude with recommending the employment of a skilful botanist to explore the unfrequented parts of our state, and particularly those portions of it considered unhealthy; as a greater number of plants, and those of the most useful kind, are found in such places, than elsewhere. Tours of this nature are by no means unfrequent, and while Americans have neglected the botanical examination of their country, foreigners have immortalised themselves by doing it. From England we have had Raleigh and Catesby, Fra-

* Donn's Hortus Cantabrigiensis, p. 100.

sier, Squibb, Lewis, and Walter; from Sweden, Professor Kalm, a pupil of Linnæus and collector for him; from Germany, Fursling and Pursh; France has sent us Michaux and Volney, and Prussia, Baron Humboldt and King. To these indeed many other names might be added; but among them all there is not one of our own countrymen—no one who has received our patronage or encouragement. If you are unwilling to engage a botanist for this purpose, let every member who is at all acquainted with the subject, engage to occupy himself in multiplying the number of local Floras; and we may thus, perhaps, obtain the vegetable contents of the state. Should this plan be adopted, each individual engaging should undertake to survey a district contiguous to his residence, with special and minute investigation. The nomenclature and classification of the vegetable tribes are now reduced to such a systematic form, that any discovery may be registered with the greatest ease and precision. If this method should be pursued with industry and skill, we might soon reverse, in regard to this region of our country, the position of the poet, and say

> *Not* "many a flower is born to blush unseen,
> And waste its sweetness on the desert air."

Catalogue of Plants

INDIGENOUS TO THE

STATE OF NEW-YORK.

Communicated to the Society, February 23d, 1814.

PREFACE.

THE following Catalogue includes only the plants, which have been collected by Messrs. Le Conte, Pursh, Eddy, Whitlow, Edmonston, Beck, and myself—it might have been enlarged by the addition of some other genera and species which have been naturalized and now grow spontaneously—but I thought it would be more proper to confine the list to those which are indigenous. It will be found that but a very few of the Cryptogamous tribes are here inserted—on some future occasion it is proposed to treat of this class more at large.

Where I have been unable to find in the lists already published, an English name for the Latin Systematick name, I have supplied it. Many inaccuracies will no doubt be found in the present catalogue, but it is hoped they are such as may be easily rectified by the botanist.

JACOB GREEN.

ABBREVIATIONS.

Ait.	Aiton.
Auct.	Auctores
Bartr.	Bartram.
Curt.	Curtis.
Cav.	Cavinille.
Desf.	Desfontaines.
Don.	Donn.
Ehrt.	Ehrhardt.
Ed.	Eddy.
Fras.	Fraser.
Frœl.	Frœlich
Gært.	Gærtner.
Hedw.	Hedwig.
H. P.	Hortus Parisiensis.
Le Con.	Le Conte.
L.	Linnæus.
Lmk.	Lamarck.
l'Her.	l'Heritier.
Lys.	Lyons.
Mich.	Michaux.
Mich. f.	Michaux filius.
Mænch.	Mœnchausen.
Muhl.	Muhlenberg.
Pers.	Persoon.
Sal.	Salisbury.
Swz.	Swartz.
Walt.	Walter.
Waug.	Waugenheim.
Willd.	Willdenow.
N. S.	New Species.
Var.	Variety.

CATALOGUE, &c.

Scientific Name.	*English Name.*
ACER	MAPLE
1 coccineum	1 scarlet
2 dasycarpum *Ehrt.*	2 silver leaved (white)
3 flavum. N. S.	3 yellow
4 montanum	4 mountain
5 negundo	5 ash leaved (box elder)
6 rubrum	6 scarlet, white, red, soft
7 saccharinum	7 sugar maple
8 striatum	8 striped maple } moose-wood
9 do. *Var.*	
ACHILLÆA	YARROW
millefolium	milfoil
ACORUS	SWEET FLAG
calamus	common } aromatic. *calamus*
ACTÆA	BANE BERRY
1 americana *N. S.*	1 American
2 ———alba.	2 white
3 cœrulea	3 blue
4 racemosa	4 black snake root
5 rubra	5 red
6 spicata	6 common, *coral and pearl*
ADIANTUM	MAIDEN HAIR
pedatum	Canadian
ADONIS	ADONIS
autumnalis	autumnal } pheasant's eye
AGARICUS	AGARICUS
campestris	———
AGRIMONIA	AGRIMONY
eupatoria *Var.*	common
AGROSTEMMA	ROSE CAMPION
githago } githago segetum *Deef.*	corn cockle

AGROSTIS	BENT GRASS
1 decumbens	1 creeping
2 filiformis	2 thread-form
3 stricta	3 upright
4 stolonifera	4 fiorin grass
AIRA	HAIR GRASS
1 melicoides *Mich.*	1 melic like
2 obtusata *Mich.*	2 blunt
ALETRIS	ALETRIS
1 farinosa alba *Mich.*	1 mealy; *Devil's bit, star grass*
2 aurea *Mich.*	2 yellow flowered
ALISMA	WATER PLANTAIN
plantago	common
ALLIUM	ONION GARLICK
1 canadense	1 wild, or American
2 cernuum	2 mountain garlick
3 tricoccum	3 broad leaved, three seeded
ALNUS	ALDER
1 incana (glauca)	1 hoary leaved (glaucous)
2 serrulata	2 common American
ALSINE	CHICKWEED
media	common
AMARANTHUS	AMARANTH, or *Cock's comb*
1 lividus	1 lead coloured
2 oleraceus	2 cultivated
AMPELOPSIS	FALSE GRAPE, or *American joy*
1 hirsuta *Lys.*	1 hairy
2 quinquefolia hedera quinquefolia. *L* cissus hederacea *Pers.*	2 five leaved wild ivy
ANAGALLIS	PIMPERNEL, or *Chick-weed*
arvensis	common
ANCHUSA	BUGLOSS
1 canescens batschia *Mich.*	1 soft
2 Virginica	2 smooth
ANDROMEDA	ANDROMEDA
1 calyculata *Var.*	1 box leaved
2 ferruginea	2 ferrugineous
3 mariana *Var.*	3 oval leaved
4 paniculata *Var.*	4 panicled
5 polifolia *Var.*	5 rosemary leaved
6 salicifolia *N. S.*	6 willow leaved
7 strigosa *N. S.*	7 slender

8 racemosa	8 cluster flowered, sweet scented
ANDROPOGON	BEARD GRASS
1 scoparium *Mich.*	1 broom
2 virginicum.	2 yellow broom grass
ANDRYALA	ANDRYALA
sinuata	crooked
ANEMONE	ANEMONE
1 dichotoma	1 wolf's bane leaved
2 hepatica, *obtusa.*	2 hepatica, *liver wort*
3 parviflora	3 small flowered
4 pennsylvanica	4 Pennsylvanian
5 quinquefolia	5 five leaved
6 thalictroides thalictrum anemonoides *Mich.*	6 meadow-rue leaved
7 virginiana	7 Virginian
ANETHUM	FENNEL
fœniculum	sweet
ANGELICA	ANGELICA
1 atropurpurea	1 purple
2 hirsuta triquinata	2 downy
ANTHEMIS	CHAMOMILE
cotula	stinking—*May weed*
ANTHOXANTHUM	VERNAL GRASS
odoratum	sweet scented
ANTIRRHINUM	SNAP DRAGON
1 canadense	1 Canadian
2 linaria vulgaris	2 common toad flax
APOCYNUM	DOG'S BANE
1 androsæmifolium	1 tutsan leaved
2 cannabinum	2 Indian hemp
3 hypericifolium	3 hypericum leaved
AQUILEGIA	COLUMBINE
canadensis	scarlet or wild
ARABIS	WALL CRESS, *or turkey pod*
1 bulbosa	1 tuberous
2 canadensis falcata *Mich.*	2 Canadian or sickle podded.
3 hispida	3 hispid or Welch
4 lyrata	4 lyre leaved
5 spathulata	5 palm leaved
6 thaliana	6 common or mouse ear
ARALIA	ARALIA
1 hispida	1 bristly
2 nudicaulis	2 wild sarsaparilla
3 racemosa	3 berry bearing spikenard

ARBUTUS	STRAWBERRY TREE
uva ursi *Amer.*	bearberry
ARCTIUM	BURDOCK
lappa	common
ARENARIA	SANDWORT
1 divaricata *Mich.*	1 severed
2 lateriflora	2 lateral flowered
3 rubra canadensis *Pers.*	3 red or field
4 stricta	4 upright
ARETHUSA	ARETHUSA
1 bulbosa	1 bulbous
2 nutans	2 nodding
3 ophioglossoides	3 adder's tongue leaved
4 pendula	4 pendant
5 stellata	5 starry
6 verticillata	6 whorl leaved
ARGOLASIA	LOOKING GLASS PLANT
aurea *N. S.* heritiera tinct.	shining
ARISTOLOCHIA	BIRTH WORT, *snake root*
1 serpentaria	1 Virginian
2 sipho	2 broad leaved
ARUM	INDIAN TURNEP
triphyllum *Var. Purp.*	three leaved
ARUNDO	REED GRASS
epigejos	small
ASARUM	SNAKE ROOT
canadense	white—*wild ginger*
ASCLEPIAS	SWALLOW WORT, *milk weed*
1 amœna *N. S.*	1 oval leaved
2 cinera *Walt.*	2 artichoke leaved
3 debilis *Mich.* *Aff. Nivea Dill.*	3 white
4 exaltata acuminata	4 poke leaved
5 grandiflorum	5 large flowering
6 incarnata	6 flesh coloured
7 longifolia	7 long leaved
8 obtusifolia	8 obtuse leaved
9 pulchra	9 hairy, river
10 purpurascens	10 purple
11 quadrifolia	11 four leaved
12 syriaca	12 common silk plant
13 tuberosa decumbens	13 pleurisy root—*butterfly weed*

14 variegata *N. S.?*	14 variegated
15 verticillata	15 whorl leaved
ASCYRUM	ANDREW'S CROSS
1 amplexicaule	1 stem clasping
2 crux andreæ	2 common
3 hypericoides	3 hypericum like
4 multicaule *Mich.*	4 many stemmed
5 stans *Mich.*	5 upright
ASPARAGUS	ASPARAGUS
officinalis	common
ASPIDIUM	ASPIDIUM
1 acrotichoides	1 ———
2 ebenum	2 *ebony*
3 filix fæmina	3 *brake*
4 marginale	4 marginal
5 tenue	5 slender
ASPLENIUM	SPLEEN WORT
1 ebenum	1 *ebony*
2 melanocaulon	2 *ruff stemmed*
3 rhizophyllum	3 ———
4 ruta *muraria* *L.*	4 wall rue
5 trichomanes	5 maiden hair
6 trichomanoides. *Mich.*	6 five leaved
ASTER	STAR WORT
1 amplexicaulis	1 stem clasping
2 conyzoides	2 flea bane
3 cordifolius	3 heart leaved
4 corymbosus	4 clustered
5 infirmis *Mich.* *cornifolius* *Willd.*	5 weak
6 latifolius	6 broad leaved
7 linarifolius	7 savoury or toad flax leaved
8 miser	8 small flowered (white)
9 novæ angliæ	9 New-England
10 novi belgii	10 glaucous or green, New Holland
11 paniculatus *N. S.*	11 panicled
12 rigidus	12 stiff leaved
13 salsuginosus *N. S.*	13 ———
14 silphioides *N. S.*	14 ———
15 solidaginoides *Mich.*	15 solidago like, golden rod
16 spurius	16 spurious
17 undulatus	17 waved leaved
ASTRAGALUS	MILK VETCH
1 canadensis	1 woolly or Canadian

2 carolinianus	2 Carolina
ATRAGENE	ATRAGENE
americana *Muhl.*	American
AVENA	OAT GRASS, OATS
1 pennsylvanica	1 Pennsylvania
2 spicata *glumosa* Mich.	2 spiked
3 elatior	3 tall
AZALEA	ROSE BAY
1 canescens *N. S.*	1 grey downy
2 canescens marginata *N. S.*	2
3 glauca	3 glaucous leaved
4 nitida *N. S.*	4 shining
5 nudiflora *Var.*	5 naked red flowered
6 microcarpa *N. S.*	6
7 procera *N. S.*	7 tall
8 racemosa.	8 branching
9 viscosa *Var.*	9 viscous
BARTRAMIA	BARTRAMIA
BARTSIA	BARTSIA
1 coccinea	1 scarlet
Var. lutea	yellow
2 pallida	2 pale
BERBERIS	BERBERRY
canadensis vulgaris L.	Canadian or common American
BETULA	BIRCH
1 glandulosa *Mich.*	1 glandulous
2 lutea *Mich.*	2 yellow
3 nigra (rubra lanulosa) *Mich.*	3 sweet scented, red beech
4 pumila	4 dwarf hairy
5 tremula	5 quivering
BIDENS	MARYGOLD
1 cernua	1 nodding burr
2 connata *Mich.*	2 marsh
3 chrysanthemoides *Mich.*	3 large flowered
BLITUM	STRAWBERRY BLITE
1 capitatum	1 common
2 virgatum	2 slender stalked
BŒHMERIA	BŒHMERIA
cylindrica	cylindrical
BOLETUS	BOLETUS
tuberosus	tuberous

BOTRYPUS	HEMLOCK FERN
lunaroides *N. S.*	kidney leaved
BRIZA	QUAKING GRASS
maxima	large
BROMUS	BROME GRASS
1 canadensis *Mich.*	1 Canadian
2 mollis	2 soft
BRACHYSTEMUM	BRACHYSTEMUM
virginicum *Mich.*	flax leaved or Virginian
linifolium *Willd.*	
BUPHTHALMUM	OX-EYE
helianthoides *l'Her.*	smooth
helianthus lævis L.	
heliopsis lævis *Pers.*	
BUCHNERA	BUCHNERA
americana	American
CACTUS	INDIAN FIG, *Cactus*
opuntia	common
CALENDULA	POT MARYGOLD
officinalis	common
CALLA	CALLA
palustris *N. S.*	marsh
Var. denticulata	*Var.* notched
CALLICARPA	CALLICARPA
americana	sage leaved
CALTHA	MARSH MARYGOLD
1 dentata	1 gaged
2 palustris	2 common
CAMPANULA	BELL FLOWER
1 acuminata	1 pointed
2 americana	2 American
3 nitida	3 shining
4 perfoliata amplexicaulis *Mich.*	4 perfoliate
5 rotundifolia	5 round leaved
CARDAMINE	LADY'S SMOCK
1 hirsuta	1 hairy
2 pennsylvanica	2 Pennsylvania water cress
3 virginica	3 Virginian
CARDUUS	THISTLE
1 horridulus	1 thorny
2 marianus	2 milk
3 pectinatus	3 pectinated

CAREX	SEG, or SEDGE
1 crinata	1 chaffy
2 hystericina	2 porcupine
3 leporina	3 hare
4 muricata	4 prickly
5 pedunculata	5 long stalked
6 rostrata	6 beaked
7 vulpina	7 great fox
CARPINUS	HORN BEAM TREE.
1 americana *Willd.*	1 American
2 ostrya	2 hop
CASSIA	CASSIA
1 chamæcrista	1 dwarf (partridge pea)
2 discolor *Don.*	2 two coloured
3 fasciculata *Mick.*	3 bundled
4 marilandica	4 wild senna (false acacia)
5 nictitans	5 nodding
CASTANEA	CHESNUT
vesca, americana *Gert.*	common American
CAULOPHYLLUM *N. S.*	CAULOPHYLLUM
CEANOTHUS	TEA TREE
americanus	common New-Jersey
——— *Var.*	
CELASTRUS	STAFF TREE
1 bullatus	1 scarlet fruited
2 scandens	2 climbing (bitter sweet)
CELTIS	NETTLE TREE
occidentalis	common American
CENCHRUS	HEDGE HOG GRASS
echinatus	rough seeded
CENTAUREA	CENTAURY
1 benedicta	1 blessed thistle
2 calcitrapa	2 star thistle
3 cyanus	3 blue bottle
4 jacea	4 knap weed
CEPHALANTHUS	BUTTON WOOD
occidentalis	American
CERASTIUM	CHICK WEED
1 arvense	1 corn pink, mouse ear
2 semidecandrum	2 least
3 viscosum	3 clammy
CERCIS	JUDAS TREE or *Red Bud*
canadensis	American
CHELIDONIUM	CELANDINE
majus	common, greater

CHELONE	HUMMING BIRD TREE
glabra	white
CHENOPODIUM	GOOSE FOOT
1 album	1 common lamb's quarters
2 glaucum	2 glaucous
3 incanum	3 hoary
4 hybridum	4 tufted
5 maritimum	5 sea
CHIRONIA	CHIRONIA
1 angularis	1 angular stemmed (American centaury)
2 chloroides	2 many petal'd, chlora like
3 campanulata	3 bell flowered
4 chronantha *N. S.*	4 ———
5 pulchella	5 dwarf
CHRYSANTHEMUM	CHRYSANTHEMUM
leucanthemum	ox eye daisy
CICHORIUM	SUCCORY
CICUTA	COW BANE
1 bulbifera	1 bulb bearing
2 maculata	2 American spotted
CIMICIFUGA	BUG WORT
1 americana	1 stinking
2 serpentaria	2 ———
CINNA	CINNA
arundinacea	reedy
CIRCÆA	NIGHT SHADE
1 alpina	1 mountain enchanter's
2 canadensis } lutetiana }	2 common
CISTUS	CISTUS or ROCK ROSE
canadensis	Canada
CLAYTONIA	CLAYTONIA
virginica	Virginian
CLAVARIA	CLAVARIA
coralloides	coral like
CLEMATIS	VIRGIN'S BOWER
1 virginica	1 Virginian
2 ——— *N. S.*	2 ———
CLEOME	BASE MUSTARD
dodecandra	clammy
CLETHRA	CLETHRA
1 alnifolia	1 smooth alder leaved
2 do *Var.*	2 ———
CLIMACIUM,	CLIMACIUM
dendroides	———

CNICUS	THISTLE
arvensis	Canada
COLLINSONIA	COLLINSONIA
canadensis	common *(horse balm)*
COMPTONIA	COMPTONIA
1 albida	1 whitish
2 asplenifolia *l'Her.* liquidambar asplenifolium *L.*	2 sweet fern
CONIUM	HEMLOCK
maculatum	common
CONVALLARIA	SOLOMON'S SEAL
1 bifolia	1 two leaved, small
2 maialis	2 common lily of the valley
3 multiflora	3 many flowered
4 polygonatum	4 common
5 pubescens	5 hairy
6 racemosa	6 cluster flowered
7 stellata streptopus *Mich.*	7 star flowered
8 trifolia	8 three leaved
9 umbellata	9 umbelliferous
CONVOLVULUS	BIND WEED
1 arvensis	1 small *(field corn)*
2 panduratus	2 fiddle leaved *(wild potatoe)*
3 purpureus	3 great purple
4 repens	4 creeping
5 sagitifolius *Mich.*	5 arrow leaved
6 sepium	6 hedge *(great bearbind)*
7 spithameus	7 dwarf
CONYZA	FLEA BANE
marilandica *Mich.* erigeron camphoratum L.	marsh
COREOPSIS	SUN FLOWER
1 alternifolia	1 alternate leaved tick seed
2 verticillata	2 whorl leaved
CORNUS	DOG WOOD
1 alba	1 white berry
2 alternifolia	2 alternate leaved
3 canadensis	3 Canadian
4 circinata *l'Her.* tomentulosa *Mich.*	4 hairy
5 florida	5 common
6 paniculata	6 paniculated

7 sanguinea	7 bloody
8 sericea *l'Her.* cœrulea *Lmk.*	8 blue berried
9 stolonifera *l'Her.*	9 creeping
10 stricta *l'Her.*	10 upright
11 *N. S.*	11
CORYDALIS	CORYDALIS
1 fungosa	1 spungy flowered
2 rosea	2 rose coloured
CORYLUS	HAZLE NUT
1 americana	1 American common *(filbert)*
2 avellana	2 European common
3 humilis	3 dwarf
4 rostrata	4 cuckold hazle
5 *N. S. Catskill.*	5 ———
CRATÆGUS	HAWTHORN
1 coccinea	1 scarlet fruited
2 cordata *Ait.*	2 maple leaved
3 crus gali	3 cock spur
4 eliptica	4 oval leaved
5 flava	5 yellow fruited
6 glaudulosa	6 hollow leaved
7 parvifolia	7 small leaved
8 punctata leucophleos *Mænch.*	8 large fruited
9 pyrifolia *Ait.*	9 pear leaved
10 sphathulata	10 spatula leaved
11 viridis	11 green fruited
CROTOLARIA	CROTOLARIA
1 parviflora	1 small flowered
2 sagitalis	2 arrow leaved
CUCUBALUS stellatus	CAMPION four leaved
CUNILA	CUNILA
1 mariana	1 mint leaved
2 pulegioides hedeoma pulegioides *Pers.*	2 penny royal leaved
CUPRESSUS thuyoides	CYPRESS TREE white cedar
CUSCUTA americana	DODDER American
CYCLAMEN americanum	CYCLAMEN, or *sow bread* American

CYMBIDIUM	CYMBIDIUM
1 odontorrhyzon	1 large tooth rooted
2 pulchellum *Willd.* angustifolium	2 beautiful tuberous
CYNOGLOSSUM officinale	HOUND'S TONGUE common
CYPERUS	CYPERUS GALINGALE
1 compressus	1 flat stemmed *(sedge)*
2 flavescens	2 yellow
3 inflexus	3 fragrant
4 parviflorus	4 small flowered
5 phymatodes *N. S.*	5 tuberous
6 strigosus	6 rough bristle spiked
CYPRIPEDIUM	LADY'S SLIPPER
1 acaule *Ait.* humile *Mich.*	1 stemless dwarf
2 candidum	2 white
3 parviflorum	3 small flowered
4 pubescens *Mich.*	4 hairy American yellow
5 spectabile *Sal.* canadense *Mich.* album *Ait.*	5 shewy tall white flowered
6 *N. S.*	6 *N. S.*
DALIBARDA	DALIBARDA
1 fragarioides	1 three leaved
2 repens	2 heart leaved
DATURA	THORN APPLE
1 stramonium	1 common *(Jamestown weed)*
2 tatula	2 blue
DENTARIA	TOOTH WORT
1 diphylla	1 two leaved *(coral wort)*
2 laciniata	2 jagged leaved
DIAPENSIA lapponica	DIAPENSIA northern
DIERVILLA	DIERVILLA
1 americana *N. S.*	1 American
2 humilis	2 dwarf
3 lutea	3 marsh
4 montana? *N. S.*	4 mountain
5 canadensis	5 yellow flowered
6 *N. S.*	6 *N. S.*
DIOSCOREA paniculata *Mich.* villosa *L.*	YAM American

DIPSACUS	TEASEL
sylvestris	wild
DIRCA	LEATHER WOOD
palustris	marsh *(moose wood)*
DOLICHOS	DOLICHOS
2 sphærospermus phaseolus *L.*	1 purple 2 round seeded
DRABA	WHITLOW GRASS
verna	spring
DRACŒNA	DRACÆNA
borealis	oval leaved
DRACONTIUM	DRAGON
fœtidum	skunk weed
DROSERA	SUN DEW
1 americana *Willd.*	1 American long leaved
2 filiformis *N. S.*	2 hairy
3 rotundifolia	3 round leaved
4 spathulata *N. S.*	4 spathulated
ECHIUM	BUGLOSS
1 americanum *N. S.*	1 American vipers
2 vulgare	2 common
ELYMUS	LIME GRASS
canadensis	Canadian
EPIGÆA	EPIGÆA
repens	creeping *(pigeon berry)*
EPILOBIUM	WILLOW HERB
1 coloratum	1 coloured
2 lævigatum	2 smooth
3 lineare oliganthum *Mich.*	3 linear leaved
4 spicatum *Lmk.*	4 narrow leaved
5 strictum	5 upright (soft)
ERIGERON	ERIGERON *(flea bane)*
1 bellidifolium *Mich.* pulchellum *Mich.*	1 Robert's plantain
2 canadense	2 annual
3 heterophyllum *Muhl.* aster aunnus *L.*	3 various leaved
4 philadelphicum do. purpureum	4 Philadelphian
5 strigosum	5 bristled
ERIOCAULON gnaphalioides *Mich.*	PIPE WORT short leaved

ERIOPHORUM	COTTON GRASS
1 angustifolium	1 narrow leaved
2 hudsonianum	2 Hudson's Bay
3 polystachion	3 common many headed
4 virginicum	4 Virginian
ERYTHRONIUM	DOG'S TOOTH VIOLET
1 americanum luteum et album	1 American yellow and white
2 dens canis	2 common
EUONYMUS	SPINDLE TREE
atropurpureus *Ait.*	purple
EUPATORIUM	EUPATORIUM
1 ageratoides *Willd.*	1 nettle leaved *(hemp seed)*
2 ceanothifolium	2 ceanothus leaved
3 cælestinum	3 blue flowered
4 coronopifolium *Willd.*	4 buck's horn leaved
5 hyssopifolium	5 hyssop leaved
6 lanceolatum	6 spear leaved
7 maculatum	7 spotted stalked
8 melissoides	8 balm leaved
9 perfoliatum	9 bonesett *(thorough wort)*
10 pubescens	10 hairy
11 purpureum	11 purple stalked
12 punctatum	12 dotted
13 rotundifolum	13 round leaved
14 sessilifolium	14 sessile leaved
15 trifoliatum	15 three leaved
16 verticillatum *Muhl.* trifoliatum *L.*	16 whorl leaved
EUPHORBIA	SPURGE
1 ipecacuanha	1 ipecacuanha
2 maculata	2 spotted
3 polygonifolia	3 knotgrass leaved
FAGUS	BEECH
1 carpinifolia	1 hornbeam leaved
2 ferruginea	2 rusty leaved
3 sylvestris	3 common
FESTUCA	FESCUE GRASS
clandestina	hidden flowered
FRAGARIA	STRAWBERRY
1 palustus	1 marsh
2 vesca	2 common garden
3 virginiana *Ehrt.*	3 wild
FRASERA	FRASERA
1 verticillata	1 pyramid flowered

2 waltheri	2 Walter's
FRAXINUS	ASH
1 concolor	1 red green
2 discolor	2 two coloured
A. americana	white
B. juglandifolia	walnut leaved
3 platyacarpa *Mich.*	3 Carolinian broad fruited
4 pubescens	4 hairy
5 sambucifolia *Mich.*	5 black elder leaved
FUCUS	FUCUS
vesiculosus	vesiculosus
FUMARIA	FUMITORY
1 glauca *Curt.* sempervirens L. corydalis sempervirens *Mich.*	1 glaucous
2 formosa	2 beautiful
3 *N. S.*	3 *N. S.*
GALACTIA	GALACTIA
ervum volubile *Walt.* gabella *Mich.*	smooth
GALEGA	GOAT'S RUE
virginita	Virginia two coloured
GALIUM	LADIES' BED STRAW
1 aparine	1 common
2 bermudianum	2 Bermudian
3 brachiatum circæzans *Mich.*	3 cross branched
4 cuspidatum	4 spit pointed
5 pennsylvanicum *Willd.*	5 Pennsylvanian
6 pilosum puncticulosum *Mich.*	6 hairy
7 tinctorium	7 dyer's
8 trifidum claytoni *Mich.*	8 trifid
GAULTHERIA	GAULTHERIA
1 hispidula	1 hispia
2 procumbens	2 mountain tea winter green
GENTIANA	GENTIAN
1 amarelloides *Mich.* quinqueflora L.	1 five leaved
2 angustifolia *Mich.*	2 narrow leaved
3 crinita *Frel.*	3 fringe flowered
4 saponaria L.	4 soap wort

5 ochroleuca saponaria *Mich.*	5 pale white
6 linearis	6 linear leaved
7 villosa	7 villous
GERANIUM	GERANIUM *(crane's bill)*
1 carolinianum	1 Carolina
Var. album	white flowered
Var. incarnatum	red flowered
2 centaureum	2 centaury
Var. hirsutum	rough
3 columbinum	3 long stalked
4 maculatum	4 spotted *(crowfoot)*
5 pusillum	5 small flowered
6 robertianum	6 herb Robert
GERARDIA	GIERARDIA
1 erecta	1 upright
2 flava	2 yellow
3 glauca *Ed.*	3 glaucous
4 pedicularia	4 louse wort leaved
5 purpurea	5 purple
6 tenuifolia	6 fine leaved
7 villosa heterophylla	7 hairy
GEUM	AVENS *(herb Bennet)*
1 album	1 white
2 floridum	2 flowery
3 hirsutum	3 rough hairy
4 rivale	4 water
5 strictum *Ait.*	5 upright
6 virginianum	6 Virginian
GLECHOMA	GROUND IVY
hederacea	common
GLYCINE	GLYCINE
1 apios	1 tuberous
2 comosa	2 close flowered
monoica	3 pea vine
Var. alba	white flowered
Var. cæreulea	blue flowered
4 umbellata	4 umbelled
GNAPHALIUM	CUDWEED *(mouse ear)*
1 dioicum	1 dioicous
2 margaritaceum	2 pearly everlasting
3 plantagineum	3 plantain leaved
4 uliginosum	4 bundled
GRATIOLA	HYSSOP
virginica	Virginian hedge

HAMAMELIS virginica	WITCH HAZEL common
HEDYSARUM	HEDYSARUM
1 canadense	1 Canadian
2 canescens	2 rough leaved
3 cuspidatum bracteosum *Mich.*	3 sharp pointed
4 divergens	4 spreading
5 frutescens lespedeza capitata *Mich.*	5 shrubby
6 glabellum	6 bare
7 glutinosum	7 clammy
8 hirtum polystachia *Mich.*	8 many spiked
9 nudicaulis	9 naked stalked
10 obtusum	10 blunt leaved
11 marilandicum	11 Maryland
12 nudiflorum	12 naked flowered
13 paniculatum	13 panicled
14 prostratum procumbens *Mich.*	14 trailing
15 reticulatum sessilifolium *Mich.*	15 nettled leaved
16 rotundifolium *Mich.* canescens *Willd.*	16 round leaved
17 violaceum	17 violet flowered
18 viridifolium	18 green flowered
19 ——— *N. S.*	19 *N. S.*
HELENIUM autumnale	HELENIUM smooth
HELIANTHUS	SUN FLOWER
1 altissimus	1 tall
2 angustifolius	2 narrow leaved
3 decapetalus	3 ten petaled
4 divaricatus	4 branching
5 frondosus	5 leafy
6 giganteus	6 gigantick
7 mollis	7 soft
8 multiflorus	8 many flowered
HELLEBORUS	HELLEBORE
1 fætidus	1 bear's foot
2 trifoliatus	2 three leaved, *gold thread*
3 viridis *Ait.*	3 green
HELONIAS	HELONIAS
1 angustifolia	1 narrow leaved

2 asphodeloides xerophyllum *Mich.*	2 grass leaved
HEUCHERA americana cortusa *Mich.*	HEUCHERA purple flowered
HUBISCUS	HIBISCUS
1 manihot	1 palmated
2 moscheutos	2 poplar leaved
3 palustis	3 marsh
4 riparius *Pers.* militaris *Cav.*	4 smooth
5 virginicus *Walt.*	5 river
HIERACIUM	HAWKWEED
1 gronovii	1 Gronovius'
2 marianum *Willd.* scabrum *Mich.*	2 rough
3 paniculatum	3 panicled
4 venosum	4 veiny leaved
5 ——— *N. S.*	5 *N. S.*
HIPPOPHAÆ canadensis	SEA BUCKTHORN Canada, oval leaved
HIPPURIS vulgaris	MARE'S TAIL common
HOLOSTEUM succulentum	CHICKWEED succulent
HOTTONIA palustris	WATER VIOLET marsh
HOUSTONIA	HOUSTONIA
1 cœrulea	1 blue
2 longifolia	2 long leaved
3 purpurea	3 red
HUDSONIA ericoides	HUDSONIA heath
HYDRASTIS canadensis	YELLOW ROOT Canada
HYDNUM imbricatum	HYDRIUM imbricated
HYDROPELTIS purpurea *Mich.*	HYDROPELTIS purple
HYDROPHYLLUM	WATER LEAF
1 scabrum *Muhl.*	1 rough
2 virginicum	2 Virginian
HYPERICUM	JOHN'S WORT
1 ascyroides macrocarpon *Mich.* bartramicum	1 large capsuled

2 canadense	2 Canadian
3 elatum *Ait.*	3 tall
4 perforatum	4 common, perforated
5 procumbens	5 procumbent
6 denticulatum *Walt.*	6 notched
7 pyrimidatum amplexicaule *Lmk.*	7 stem clasping
8 rosmarinifolium *Lmk.*	8 ———
9 virginicum	9 Virginian
10 ——— *N. S.*	10 *N. S*
HYPOXIS	STAR-FLOWER
1 erecta	1 upright bastard
2 juncea	2 rush leaved
ILEX	HOLLY
1 aquifolium	1 common
2 canadensis *Mich.* prunifolia	2 Canadian
3 opaca *Ait.*	3 Carolinian
IMBRICARIA convexicaulis	IMBRICARIA convex stalked
IMPATIENS	BALSAM
1 maculata	1 spotted
2 noli tangere	2 touch me not
INULA	ELECAMPANE
1 helenium	1 common
2 linearis *N. S.*	2 linear
IRIS	FLAG *(flower de luce)*
1 cristata	1 crested
2 versicolor	2 many coloured
3 *Var. Major.*	3 large
4 virginica versicolor *Auct.*	4 Virginian
5 ——— *N. S.* ———	5 *N. S.*
6 ——— *N. S. LeCon.*	6 *N. S.*
IVA frutescens	IVA *(bastard Jesuit's bark)* shrubby
JUGLANS	WALNUT *or hickory*
1 alba tomentosa *Mich.*	1 white heart
2 amara *Mich.*	2 bitter
3 compressa *Gært.* alba *Mich.* squamosa *Mich. f.*	3 shell bark

4 *Spec.* microcarpa	4 common
5 cinerea ——— *f.* cathartica *Mich.*	5 butternut *(white)*
6 hybrida *N. S.*	6 hybrid
7 nigra	7 black
8 *Spec.* oblonga glabra *Muhl.*	8 oblong
9 porcina *Mich. f.*	9 pignut
10 regia	10 common, royal
JUNCUS	RUSH GRASS
1 effusus	1 soft
2 bulbosus	2 bulbous, round fruited
3 marginatus	3 marginated
4 melanocarpus	4 black fruited
5 echinatus polycephalus *Mich.*	5 many headed
6 nodosus	6 knotty
7 setaceus	7 bristly
8 squarrosus	8 moss or goose corn
9 sylvaticus	9 wood
JUNIPERUS	JUNIPER *or cedar*
1 communis repens *Don.*	1 common
2 prostrata	2 creeping
3 virginiana	3 red
KALMIA	KALMIA *or laurel*
1 angustifolia	1 narrow leaved
2 ——— *Var.*	2 ———
3 glauca *Ait.*	3 glaucous
4 latifolia	4 broad leaved
5 rosmarinifolia *N. S.*	5 rosemary leaved
LACTUCA elongata *Muhl.*	LETTUCE narrow leaved
LAMIUM	NETTLE *(Henbit)*
1 amplexicaule	1 common dead
2 purpureum	2 purple
LAURUS	BAY TREE *or laurel*
1 benzoin	1 wild alspice, fever bush
2 diospyros	2 persimmon
3 sassafras	3 sassafras
LECHEA	LECHEA
1 major *Mich.*	1 large
2 minor *L.*	2 small
3 racemulosa *Mich.*	3 bunch flowered

LEDUM	LEDUM
1 latifolium	1 Labrador tea
2 palustre	2 marsh
3 thymifolium *Lmk.*	3 thyme leaved
LEONURUS	MOTHER WORT
cardiaca	common
LESPEDEZA	LESPEDEZA
1 capitata *Mich.*	1 capitated
2 linearis *N. S.*	2 linear
3 polystachya *Mich.*	3 many spiked
4 procumbens *Mich.*	4 trailing
LIATRIS	LIATRIS
1 aspera spicata *Willd.*	1 rough
2 macrostachya *Mich.*	2 blue blazing star, long guted
3 pilosa *Ait.*	3 hairy
4 scanota	4 ragged cupped
5 squarrosa	5 rough headed
LICHEN	LICHEN
frucata	
LIGUSTICUM	LOVAGE
actæifolium cicuta maculata *L.*	actæa leaved
LIGUSTRUM	PRIVET *or Prim*
vnlgare	common
LILIUM	LILY
1 canadense coccineum	1 Canadian
2 pennsylvanicum *Don.*	2 Pennsylvanian
3 philadelphicum	3 Philadelphian
4 superbum	4 superb golden martagon
LIMODORUM	LIMODORUM
unifolium	one leaved
LINARIA	LOAD FLAX
vulgaris	common
LINNÆA	LINNÆA
borealis *rubra.*	two flowered (northern)
LINUM	FLAX
usitatissimum	common
LIQUIDAMBAR	SWEET GUM
styraciflua	maple leaved
LIRIODENDRON	TULIP TREE
tulipifera	white poplar
LITHOSPERMUM	GROMWELL
1 arvense	1 corn

2 officinale latifolium *Mich.*	2 officinal
3 virginianum onosmodium hispidum *Mich.*	3 hispid
LOBELIA	LOBELIA
1 cardinalis	1 cardinal flower, scarlet
2 claytonia *Mich.*	2 claytons
3 inflata	3 inflated
4 kalmii	4 Kalm's
5 pallida goodenoides *Willd.*	5 pale
6 puberula	6 hairy
7 syphilitica	7 blue
LONICERA	HONEYSUCKLE
1 caprifolium bracteosum *Mich.* dioica parviflora *Pers.* glauca *Fras.*	1 glaucous
2 grata	2 evergreen
3 sempervirens	3 trumpet
4 ciliata	4 fringed
5 diervilla diervilla lutea *Desf.*	5 yellow
6 *N. S. Le Con.*	6 *N. S.*
LUDWIGIA	LUDWIGIA
1 macrocarpa *Mich.* alternifoli	1 alternate leaved
2 hirsuta *Walt.*	2 hairy
3 nitida *Mich.* isnardia palustris *L.*	3 shining
LUPINUS	LUPINE
perennis	perennial
LYCIUM	BOX THORN
carolinianum *Mich.* salsum *Bartr.*	samphire
LYCHNIS	LYCHNIS
chalcedonica	scarlet
LYCOPODIUM	CLUB MOSS
1 complanatum	1 arbor vitæ leaved
2 dendroideum	2 ———
3 rupestre	3 rock
LYCOPUS	WATER HOREHOUND
1 americanus	1 American
2 uniflorus	2 little

3 virginicus	3 Virginian
LYSIMACHIA	LYSIMACHIA
1 angustifolia *Willd.*	1 narrow leaved
2 ciliata cordata	2 ciliated, heart leaved
3 quadrifolia	3 four leaved
4 heterophylla	4 various leaved
5 hirsuta *Mich.*	5 hairy
6 racemosa *Mich.* stricta *Ait.* bulbifera *Curt.*	6 bulb bearing
7 thyrsiflora	7 cluster flowered, tufted
MAGNOLIA	MAGNOLIA
1 acuminata	1 cucumber tree, blue flowered
2 glauca *Var.*	2 swamp, white bay, sweet
MALAXIS liliifolia *Swz.* Ophrys liliifolia	MALAXIS lily leaved
MALVA	MALLOW
1 americana	1 American
2 caroliniana	2 Carolina, creeping
3 rotundifolia	3 round leaved
4 sylvestris	4 common
MEDICAGO lupulina	MELICK black, *none such*
MELAMPYRUM lineare americanum *Mich.*	COW WHEAT American
MELILOTUS	MELILOT
1 alba	1 white
2 vulgaris	2 common
MENISPERMUM	MOON SEED
1 Canadense	1 Canadian
2 Virginicum	2 Virginian
MENTHA	MINT
1 canadensis borealis *Mich.*	1 northern
2 gracilis	2 slender
3 piperita.	3 pepper
4 pulegium	4 pennyroyal
MENYANTHES	BUCK BEAN
1 trachysperma *Mich.*	1 pitted

2 trifoliata	2 marsh *trefoil*, 3 leaved
MESPILUS	MEDLAR
montana *N. S.*	mountain
MIKANIA	MIKANIA
scandens *Willd.* / Eupatorium scandens *Auct.*	climbing
MIMULUS	MONKEY FLOWER
1 alatus *Ait.*	1 winged stemmed
2 ringens	2 gaping flowered
MITCHELLA	MITCHELLA
repens	creeping
MITELLA	CANICLE
diphylla	two leaved, bastard American
MNIUM	MNIUM
1 cuspidatum	1 ———
2 rosaceum	2 ———
MONARDA	MOUNTAIN MINT
1 fistulosa	1 Robin run-away
2 oblongata mollis *Willd.*	2 long leaved, soft,
3 punctata	3 dotted, *horse mint*
4 rugosa	4 wrinkled, white
MONOTROPA	BIRD'S NEST
uniflora	one flowered, broom rape
MORUS	MULBERRY
rubra	red
MUCOR	MUCOR
1 cespitosus	1 ———
2 mucedo	2 ———
MYOSOTIS	SCORPION GRASS
1 lappula	1 prickly seeded
2 scorpioides	2 marsh
3 virginica	3 Virginian
MYRICA	CANDLE BERRY MYRTLE
1 cerifera	1 wax bearing
2 gale	2 sweet, common
3 pennsylvanica *Muhl.*	3 Pennsylvanian
MYRRHIS	CICELY
scandix	sweet rooted
NARTHECIUM	NARTHECIUM
1 glutinosum *Mich.*	1 clammy
2 ilvense *N. S.*	2 ———

NEOTTIA	NEOTTIA
1 æstivalis Ophrys æstivalis *Mich.*	1 summer
2 cernua *Willd.* O. cernua	2 drooping, ladies traces
3 pubescens *Willd.* Satyrium repens *Mich.*	3 variegated
NEPETA cataria	CATMINT, *or catnep* common
NEPHRODIUM *Mich.* POLYPODIUM *Auc.*	SHIELD FERN
1 acrostichoides *Mich*	1 terminal
2 cristatum *Mich.*	2 crested
3 filix fœmina *Mich.*	3 female
4 marginale	4 marginal
5 noveboracense	5 New-York
6 tenue *Mich.*	6 slender
7 thelypteroides *Mich.*	7 marsh
NICOTIANA	TOBACCO
1 paniculata	1 panicled
2 rustica	2 common
NIGELLA damascena	FENNEL FLOWER common
NYMPHÆA	WATER LILY
1 advena *Ait.*	1 striped flowered
2 alba	2 white flowered
3 lutea	3 yellow flowered
4 minima	4 small
5 odorata *Ait.*	5 sweet scented
6 rosea	6 rose like
7 *N. S.*	7 *N. S.*
NYSSA	TUPELO TREE
1 aquatica biflora *Mich.* integrifolia *Ait.*	1 water—*sour gum*
2 villosa *Mich.* triflora *Wang.*	2 rough—*Pepperidge*
ŒNOTHERA	TREE PRIMROSE
1 biennis	1 common
2 fruticosa	2 perennial
3 grandiflora *Ait.*	3 large flowered
4 longiflora	4 long flowered
5 muricata	5 prickly stalked

6 parviflora	6 small flowered
7 pumila	7 dwarf
ONOCLEA	ONOCLEA
sensibilis	sensitive fern
OPHIOGLOSSUM	ADDER'S TONGUE
vulgatum	common
ORCHIS	ORCHIS
1 blephariglottis *Willd.*	1 white
2 ciliaris	2 orange coloured
3 clavellata	3 yellow
Var. tridentata	
4 flava	4 ragged
Var. virescens	
5 lacera psycodes *Willd.*	5 short spurred
6 psycodes *L.* / cristata *Mich.*	6 round leaved
7 rotundifolia	7 club spurred
8 quinqueseta *Mich.*	8 many lipped
9 spectabilis	9 pale, shewy
humilis *Mich.*	
ORIGANUM	MARJORAM
vulgare	common
ORNITHOGALUM	STAR OF BETHLEHEM
umbellatum	umbel flowered
OROBANCHE	BROOM RAPE
1 uniflora	1 one flowered
2 virginiana	2 Virginian *Cancer root*
ORONTIUM	ORONTIUM
1 aquaticum	1 water
2 angustifolium	2 pointed leaved
OSMUNDA	OSMUNDA
1 cinnamomea *Mich.*	1 woolly
2 claytonia *Mich.*	2 claytons
3 interrupta *Mich.*	3 interrupted
4 regalis	4 flowering fern
OXALIS	WOOD SORREL
1 acetosella	1 common
2 stricta	2 upright
3 violacea	3 violet coloured
PANAX	GINSENG
1 quinquefolium	1 officinal
2 trifolium	2 three leaved
PANICUM	PANIC GRASS
1 crus-galli	1 cock's foot
2 dichotomum	2 divided branched

3 hispidum	3 hispid
4 latifolium	4 broad leaved
5 pubescens	5 soft, hairy
6 sanguinale	6 bloody
7 viride	7 green *bottle grass*
PARNASSIA	GRASS OF PARNASSUS
1 americana	1 American
2 asarifolia	2 kidney leaved
3 caroliniana *Mich.*	3 Carolinian
PASTINACA	PARSNEP
noxia	poisonous
PEDICULARIS	LOUSE WORT
1 asplenifolia *Muhl.*	1 fern leaved
2 canadensis } verna }	2 spring
3 galericulata	3 ———
4 gladiata *Mich.*	4 yellow flowered
PENSTEMON	PENSTEMON
pubescens *Ait.* } Chelone pentstemon }	downy, purple
PEZIZA	PEZIZA
1 lentifera	1 ———
2 punctata	2 dotted
PHALARIS	CANARY GRASS
arundinacea	reed
PHALLUS	PHALLUS
impudica	———
PHILADELPHUS	MOCK ORANGE
odorus	scented
PHLOX	LYCHNIDEA
1 divaricata	1 blue, divaricated
2 maculata	2 spotted
3 paniculata	3 panicled
4 suaveolens *Ait.*	4 white flowered
5 subulata	5 mountain pink
6 undulata	6 wave leaved
PHRYMA	PHRYMA
leptostachya	small flowered
PHYSALIS	WINTER CHERRY
pennsylvanica	Pennsylvanian
PHYTOLACCA	POKE WEED
decandra	common
PINUS	PINE or *fir tree*
1 alba *Ait.* } laxa *Ehrt.* }	1 white
2 balsamea	2 silver, *Balm of Gilead*

3 canadensis Abies candensis *H. P.*	3 hemlock spruce
4 inops *Ait.*	4 Jersey or scrub pine
5 mitis *Mich.*	5 yellow pine, short leaved
6 nigra *Ait.* denticulata *Mich.*	6 black spruce
7 pedula *Ait.*	7 black larch
8 microcarpa	8 red larch
9 rigida *Mich. f.* resinosa *Auct.*	9 pitch pine
10 rubra	10 red spruce fir
11 serotina *Mich.*	11 pond pine
12 strobus	12 Weymouth pine
13 taxifolia	13 Nootka fir
PISUM	PEA
maritimum	sea
PLANTAGO	PLANTAIN
1 cordata *Var.* microphylla	1 heart leaved
2 lanceolata	2 rib wort
3 major	3 great
4 maritima	4 sea
5 media *Var.* crassifolia	5 hoary leaved
6 virginica	6 Virginian
PLATANUS	PLANE TREE or *large button wood*
occidentalis	American
POA	MEADOW GRASS
1 annua	1 dwarf
2 compressa	2 blue grass
3 palustris crocea *Mich.*	3 marsh
4 pratensis	4 common
5 reptans	5 creeping
6 trivialis	6 field
PODALYRIA baptista tinctoria *Willd.*	PODALYRIA or *Wild Indigo* dyer's
PODOPHYLLUM	DUCK'S FOOT, *May apple*
peltatum	peltated
POLEMONIUM	JACOB'S LADDER
reptans	creeping
POLYGALA	MILKWORT
1 cruciata	1 cross shaped

2 incarnata	2 flesh coloured
3 lutea nana *Mich.*	3 yellow flowered
4 paucifolia	4 evergreen snakeroot
5 rubella polygama *Walt.*	5 polygamous
6 sanguinea	6 bloody
7 senega	7 Senega snakeroot
8 verticillata	8 whorled leaved
POLYGONUM	KNOT WEED
1 arifolium	1 halbert leaved
2 aviculare	2 knot grass
3 coccineum	3 scarlet
4 fagopyrum	4 buck wheat
5 hydropiper	5 water pepper
6 lapathifolium *Ait.*	6 pale flowered
7 pennsylvanicum *Curt.*	7 Pennsylvanian
8 persicaria	8 spotted
9 sagitatum	9 arrow leaved
10 scandens	10 climbing
11 virginianum rostratum	11 Virginian
POLYPODIUM	POLYPODY
1 hexagonopterum	1 ———
2 virginicum	2 Virginian
3 vulgare	3 common
POLYTRICHUM	POLYTRICHUM
1 ambiguum	1 ambiguous
2 pennsylvanicum	2 Pennsylvanian
PONTEDERIA	PONTEDERIA
cordata	heart leaved
POPULUS	POPLAR TREE
1 angulata *Ait.* angulosa *Mich.*	1 angular—*Cotton tree*
2 balsamifera	2 Tacamahac—*Balsam poplar*
3 candicans	3 heart leaved
4 grandidentata *Mich.* trepida *Muhl.*	4 Canada
5 heterophylla	5 various leaved
6 monilifera	6 ———
7 tremuloides *Mich.*	7 smooth—*Aspen*
PORTULACA	PURSLAIN
oleracea	common
POTENTILLA	CINQUEFOIL
1 anserina	1 wild tansy

2 canadensis	2 Canada
3 fruticosa	3 shrubby
4 floribunda *N. S.*	4 many flowered
5 hirsuta	5 hairy
6 pennsylvanica	6 Pennsylvanian
7 *N. S.* affin. *Penn.*	7 ———
8 recta	8 upright
9 reptans	9 creeping
10 sarmentosa *Willd.*	10 running
11 simplex	11 simple
POTHOS	POTHOS
1 fœtida *Ait.* Dracontium fœtidum	skunk cabbage
PRENANTHES	PRENANTHES
1 alba	1 white flowered
2 altissima	2 tall
3 cordata	3 heart leaved
4 muralis	4 wall
5 spicata *Walt.*	5 spiked
6 virgata *seu* rubicunda	6 red flowered
PRIMULA	PRIMROSE
1 farinosa	1 birds' eye
2 mistasinica	2 Canadian
PRINUS	WINTER BEBRY
1 glaber	1 evergreen—*Ink berry*
2 do. *Var.*	2 ———
3 lanceolatus *Don.*	3 spear leaved
4 lævigatus	4 smooth
5 montanus *N. S.*	5 mountain
6 padifolius	6 broad leaved
7 verticillatus	7 whorled
PRUNELLA	SELF HEAL
1 mariana	1 sea
2 pennsylvanica *Willd.* ovata *H. P.*	2 Pennsylvanian
3 vulgaris	3 common
PRUNUS	CHERRY TREE
1 americana	1 American
2 canadensis	2 Canadian
3 montana *N. S.*	3 mountain
4 pennsylvanica *Ait.* borealis *Mich.*	4 upright
5 nigra (americana)	5 yellow plumb
6 pumila	6 dwarf plumb
7 serotina	7 wild cherry
8 virginiana	8 choke cherry

PTERIS	BRAKE
1 aquilina	1 common
2 atropurpurea	2 purple
PULMONARIA	LUNG WORT
1 sibirica	1 Siberian
2 virginica	2 Virginian
PYCNANTHEMUM	MOUNTAIN MINT
1 canescens *Mich.*	1 white
2 incanum *Mich.*	2 hoary
PYROLA	WINTER GREEN
1 asarifolia	1 kidney leaved
2 maculata	2 variegated leaved
3 minor	3 small
4 rotundifolia	4 round leaved
5 secunda	5 notched leaved
6 umbellata	6 umbelled
7 uniflora	7 one flowered
PYXIDANTHERA	PYXIDANTHERA
barbulata *Mich.*	bearded
PYRUS	PEAR OR APPLE
1 botryapium *Willd.*	1 blue fruited
2 cydonia	2 common quince
3 erythrocarpa	3 red fruited
4 melanocarpa	4 black fruited
5 ovalis	5 oval leaved
QUERCUS	OAK
1 alba	1 common white
2 bicolor	2 swamp
3 castanea	3 yellow, chesnut
4 coccinea *Mich.*	4 scarlet
5 falcata	5 Spanish, downy, red
6 filiformis	6 long stalked
7 ilicifolia *Willd.* banisteri *Mich.*	7 scrub or barren
8 macrocarpa *Mich.*	8 large fruited
9 montana *Willd.* prinus monticola *Mich.*	9 rock chesnut
10 monticola	10 rock oak
11 olivæformis	11 mossy cup
12 heterophylla	12 various leaved
13 nigra ferruginea	13 black jack
14 obtusiloba *Mich.* stellata *Willd.*	14 post white
15 palustris *Mich.* *Var.* humilis	15 pin

16 prinus prinus palustris *Mich.*	16 chesnut white
17 maritima	17 sea willow
18 prinoides	18 chinquapin
19 rubra	19 red
20 tinctoria	20 black, dyers'
21 triloba	21 downy black
QUERIA	QUERIA
canadensis Anychia dichotoma *Mich.*	forked
RANUNCULUS	CROW FOOT
1 acris	1 upright
2 bulbosus	2 bulbous
3 hirsutus *N. S.*	3 hairy
4 flammula	4 small Spear wort
5 marilandicus	5 Maryland
6 pennsylvanicus	6 Pennsylvanian
7 saniculæformis	7 sanicle leaved
8 sceleratus	8 celery leaved
9 recurvatus	9 bent
10 trifoliatus	10 three leaved
RAPHANISTRUM	RAPHANISTRUM
luteum	marsh
RHAMNUS	BUCK THORN
catharticus	purging
RHEXIA	RHEXIA
1 virginica	1 common
2 fungosa *N. S.*	2 fungous *N. S.*
3 ——— *N. S.*	3 ——— *N. S.*
RHINANTHUS	YELLOW RATTLE
virginicus	Virginian
RHODODENDRON	ROSE BAY
maximum	mountain laurel
RHODORA	RHODORA
canadensis	Canada
RHUS	SUMACH
1 copallinum æstivale	1 copal
2 glabrum	2 common, smooth
3 fœtans	3 stinking
4 radicans	4 climbing poison vine
5 toxicodendron	5 trailing poison oak
6 typhinum	6 woolly
7 vernix	7 varnish tree

RIBES	CURRANT
1 atropurpureum	1 dark red
2 cynosbate	2 prickly fruited
3 floridum *Willd.*	3 large fruited
4 glandulosum	4 glanulous, procumbent
5 gracile *Mich.*	5 slender, two flowered
6 rigens *Mich.*	6 upright, red fruited
7 *N. S.* fruct. alba.	7 *N. S.*
8 *N. S.* Cattskill	8 *N. S.*
ROBINIA	ROBINIA *Locust tree*
1 pseud-acacia	1 false acassia
2 viscosa glutinosa *Curt.*	2 clammy
ROSA	ROSE
1 caroliniana parviflora *Muhl.*	1 Pennsylvania
2 canina	2 dog rose
3 corymbosa	3 swamp
4 gemella	4 twin flowered
5 lucida *Ehrt.*	5 shining leaved
6 rubiginosa	6 sweet briar
RUBUS	BRAMBLE
1 hispidus	1 strawberry leaved
2 lucidus *N. S.*	2 shining
3 occidentalis	3 American raspberry
4 odoratus	4 flowering raspberry
5 parvifolius *Walt.*	5 small leaved blackberry
6 plicatus *N. S.*	6 ———
7 procumbens	7 dewberry
8 strigosus *Mich.*	8 mountain
9 villosus *Ait.* vulpinus *Desf.*	9 American blackberry
10 ——— *N. S.*	10 *N. S.*
11 ——— *N. S.* Cattskill	11 *N. S.*
RUDBECKIA	RUDBECKIA
1 aspera	1 rough
2 digitata	2 digitated
3 laciniata	3 jagged leaved
4 triloba	4 three lobed
RUMEX	DOCK
1 acetosella	1 sheep sorrel
2 acutus	2 sharp pointed
3 aquaticus	3 water
4 crispatulus	4 curled
5 persicarioides	5 arsesmart leaved

6 sanguineus	6 bloody
7 verticillatus	7 whorled
SAGITTARIA	ARROW-HEAD
1 graminifolia	1 grass leaved
2 heterophylla	2 various leaved
3 latifolia *Willd.*	3 broad leaved
4 obtusa *Muhl.* simplex *Pers.*	4 blunt leaved
5 pubescens	5 hairy
6 sagittifolia	6 pointed leaved
SALICORNIA	GLASS WORT
1 ambigua	1 doubtful
2 herbacea	2 marsh
3 virginica	3 Virginian
SALIX	WILLOW
1 caroliniana	1 Carolina
2 conifera *Willd* longirostris *Mich.*	2 cone bearing
3 discolor	3 red rooted
4 incana *Mich.*	4 hoary
5 myricoides *Muhl.*	5 gale leaved
6 nigra *Muhl.*	6 black
7 palustris *N. S.*	7 marsh
8 ——— *N. S.*	8 *N. S.*
SALSOLA	SALT WORT
1 kali	1 prickly
2 soda	2 long leaved
SALVIA	SAGE
1 lyrata	1 lyre leaved
2 officinalis	2 officinal or common
SAMBUCUS	ELDER
1 canadensis atropurpurea	1 Canadian black berried
2 pubescens *Mich.* rubra	2 red berried
SANGUINARIA canadensis	BLOOD ROOT American—*Puccoon*
SANGUISORBA	BURNET SAXIFRAGE
1 canadensis	1 long spiked
2 media	2 short spiked
SANICULA	SANICLE
1 canadensis	1 Canadian
2 marilandica	2 Maryland, black snake root
SAPONARIA officinalis	SOAP WORT common

SARRACENIA	SIDE SADDLE FLOWER
1 purpurea	1 purple
2 do. *Var.*	2 ———
SAURURUS	LIZARD'S TAIL
cernuus	nodding
SAXIFRAGA	SAXIFRAGE
1 nivalis (vernalis)	1 early
2 pennsylvanica	2 common American
3 virginica *Mich.*	3 Virginian
SCHEUCHZERIA	SCHEUCHZERIA
palustris	marsh
SCHŒNUS	DOG RUSH
1 albus	1 white
2 ciliaris	2 fringed
3 glomeratus	3 round headed
4 fuscus	4 brown
5 setaceus	5 bristly
6 sparsus	6 spreading
SCIRPUS	CLUB RUSH
1 capitatus	1 headed
2 lacustris	2 bulrush
3 macrostachius *Mich.*	3 large spiked
4 sylvaticus	4 wood
5 triqueter *Mich.* americanus. *Pers.*	5 three sided
SCUTELLARIA	SCULL CAP
1 galericulata	1 common
2 hyssopifolia	2 hyssop leaved
3 integrifolia	3 entire leaved
4 lateriflora	4 lateral flowered
5 ovalifolia *Pers.* eliptica	5 oval leaved
6 parviflora	6 small flowered
SELINUM	MILK PARSLEY
canadense	Canadian
SENECIO	GROUNDSEL
1 aureus	1 golden, heart leaved
2 balsamitæ	2 balsamita like
3 canadensis	3 Canadian
4 hieracifolius	4 hawk weed leaved
5 obovatus	5 obovate leaved
SILENE	CATCH FLY
pennsylvanica *Mich.*	Pennsylvanian
SINAPIS	MUSTARD
nigra	black

SISYMBRIUM	SISYMBRIUM
nasturtium	water cress
SISYRINCHIUM	SISYRINCHIUM
1 anceps. *Lmk.* gramineum *Curt.*	1 grass leaved
2 mucronatum *Mich.*	2 blue eyed grass
SMILAX	SMILAX
1 caduca	1 deciduous
2 glauca *Mich.* sarsaparilla	2 medicinal
3 herbacea	3 herbaceous
4 hispida	4 hispid
5 laurifolia	5 laurel leaved
6 peduncularis	6 long stslked
7 quadrangularis *Muhl.*	7 square stalked
8 rotundifolia	8 round leaved
SMYRNIUM	ALEXANDERS
1 aureum	1 golden
2 barbinode	2 bearded
3 integerimum	3 entire leaved
4 trifoliatum thapsia *L.*	4 heart leaved
SOLANUM	NIGHTSHADE
1 dulcamara	1 bitter sweet
2 nigrum	2 common
SOLIDAGO	GOLDEN ROD
1 arguta	1 sharp notched
2 axillaris *N. S.*	2 ————
3 aspera	3 rough leaved
4 canadensis	4 Canadian
5 ciliaris	5 ciliated
6 flexicaulis	6 bent stalked
7 gigantea	7 gigantic
8 lanceolata *Ait.* spec. graminifolia	8 spear leaved
9 latifolia	9 broad leaved
10 noveboracensis	10 New-York
11 nemoralis *Ait.*	11 wood
12 odora *Ait.*	12 sweet scented
13 patula	13 open branched
14 rigida	14 hard leaved
15 rugosa	15 wrinkled leaved
16 scabra	16 rough
17 squarrosa	17 scurfy
18 sempervirens	18 narrow leaved
19 ulmifolia	19 elm leaved

20 virga aurea	20 common
21 *N. S.*	21 *N. S.*
22 *N. S.*	22 *N. S.*
23 *N. S.* aff. virga. aurea.	23 ———
24 *N. S.* aff. concolor	24 ———
25 *N. S.* Cattskill	25 ———
26 petiolaris	26 late flowered
SONCHUS	SOW THISTLE
1 alpinus	1 Alpine Canadian
2 acuminatus	2 pointed
3 arvensis	3 corn
4 floridanus	4 large flowered
5 leucophleus	5 white flowered
6 oleraceus *Var.* asper	6 common
7 pallidus *Willd.*	7 pale
8 palustris	8 marsh
9 macrophyllus	9 large leaved
SORBUS	SERVICE TREE
montana *N. S.*	mountain
SPARGANIUM	BURR REED
erectum	upright
SPARTINA	ROUGH GRASS
1 glabra	1 smooth
2 polystachia Trachynotia *Mich.*	2 many spiked
SPARGANOPHORUS	SPARGANOPHORUS
verticillatus *Mich.*	whorled
SPARTIUM	BROOM
scoparium	common
SPHAGNUM	SPHAGNUM, *Peat Moss*
vulgare *Mich.* latifolium *Hed.*	broad leaved
SPIRÆA	SPIRÆA
1 alba	1 white flowered
2 aruncus	2 goats' beard
3 crenata	3 crenated
4 corymbosa carpinifolia *Willd.*	4 broad leaved
5 hypericifolia	5 St. Johns wort leaved
6 lobata	6 lobe leaved
7 montana	7 mountain
8 opulifolia	8 snow ball leaved
9 stipulata	9 large stipuled
10 tomentosa	10 downy leaved

11 trifoliata Gillenia trifoliata *Mænch.*	11 Indian physic, ipecacuanha
STACHYS	HEDGE NETTLE
1 aspera *Mich.*	1 rough
2 tenuifolia *Muhl.*	2 thin leaved
STAPHYLEA	BLADDER NUT
1 pinnata *Var.*	1 pinnated
2 trifoliata	2 three leaved
STATICE	THRIFT
limonium	marsh rosemary
TEUCRIUM	GERMANDER
1 canadense	1 nettle leaved
2 virginicum	2 Virginian
THALICTRUM	MEADOW RUE
1 rugosum *Ait.*	1 rough leaved
2 ——— affin.	2 ———
THESIUM	BASTARD TOAD FLAX
umbellatum	umbelled
THLAPSI	BASTARD CRESS
1 arvense	1 penny cress
2 bursa pastoris	2 shepherd's purse
3 campestre	3 mithridate mustard
THUYA	ARBOR VITÆ
occidentalis	American—*White cedar*
THYMUS	THYME
virginicus	Virginian
TIARELLA	TIARELLA
cordifolia	heart leaved
TILIA	LIME OR LINDEN TREE
1 americana	1 bass wood
2 glabra	2 smooth, bass wood.
3 pubescens	3 white wood—*hairy*
TRICHOSTEMMA	TRICHOSTEMMA
1 dichotoma	1 branched
2 lineare	2 linear leaved
TRIENTALIS	WINTER GREEN
europea	chick weed
TRIFOLIUM	CLOVER OR TREFOIL
1 arvense	1 hare's foot
2 pennsylvanicum	2 Pennsylvanian
3 repens	3 white clover
TRILLIUM	TRILLIUM
1 erectum atropurpureum *Curt.*	1 upright flowered

2 erythrocarpon *Mich.* undulatum	2 red fruited
3 grandiflorum	3 tulip
4 luteum	4 yellow
5 pendulum	5 pendent
6 pictum	6 dotted
7 pusillum	7 dwarf
8 sessile atropurpureum	8 sessile
9 umbellatum	9 umbellated
TRIOSTEUM	FEVER WORT
perfoliatum majus *Mich.*	perfoliate
TROLLIUS americanus *Muhl.*	GLOBE FLOWER American
TURRITIS	TOWER MUSTARD
1 hirsuta	1 hairy
2 lævigata	2 American smooth
TYPHA	CAT'S TAIL or *Reed Mace*
1 angustifolia	1 narrow leaved
2 latifolia	2 broad leaved
ULMUS	ELM TREE
1 americana	1 common weeping
2 aspera fulva *Mich.*	2 slippery, red
UNIOLA spicata Festuca distichophylla	SPIKE GRASS common
UMBILICARIA	UMBILICARIA
1 pustulata	1 blistered
2 vellea	2 ———
URTICA	NETTLE
1 canadensis	1 Canadian
2 divaricata	2 divaricated
3 gracilis	3 slender stalked
4 procera	4 tall
5 pumila	5 dwarf
6 urens	6 lesser
7 whitlowi *Muhl.*	7 Whitlow's*

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* *Dr. Muhlenberg's Description of the Urtica Whitlowi.*

Caule. 5 angulo, simplici, orgyali, urente.
Foliis alternis, cordato-ovatis, acutis, serratis, trinerviis, punctatis, petiolatis, supremis oppositis.
Stipula bifida.—

URTICULARIA	HOODED MILFOIL
ceratophylla	horn leaved
UVULARIA	BELLWORT
1 langiinosa	1 woolly
2 lanceolata	2 spear leaved
3 perfoliata	3 perfoliate
4 rosea	4 rose coloured
5 sessilifolia	5 sessile leaved
VACCINIUM	WHORTLE BERRY
1 album	1 white
2 cespitosum	2 dwarf
3 corymbosum *L.*, amœnum *Ait.*, disomorphum *Mich.*	3 broad leaved—*bilberry*
4 frondosum, glaucum *Mich.*	4 bushy
5 ligustrinum *Mich.*	5 privet leaved
6 macrocarpon *Ait.*	6 American cranberry
7 oxycoccus	7 common
8 pennsylvanicum *Mich.*	8 sugar
9 resinosum *Ait.*	9 clammy
10 myrtilloides	10 bluets
11 stamineum	11 green wooded
12 tenellum	12 gale leaved
13 venustum	13 red twigged
14 virgatum pennsylvanicum *Mich.*	14 blue huckle berry
VALERIANA	VALERIAN
pauciflora	three leaved
VERATRUM	SWAMP HELLEBORE
1 luteum	1 nodding *(blazing star)*
2 viride *Ait.*	2 green flowered
VERBASCUM	MULLEIN
1 blattaria	1 moth
2 thapsus	2 great
VERBENA	VERVAIN
1 hsstata	1 halbert leaved
2 urticifolla	2 nettle leaved

Paniculis pedunculatis, axillaribus, dichotomis, hirsutis, petiolo longioribus masculis, et terminalibus fœmineis—

Capsula orbicularis, compressa, mucronata, proxime *divaricata* et *candensis*.

Radix perennis, tuberosa.

VERNONIA noveboracensis *Mich.*	VERNONIA common
VERONICA	SPEEDWELL
1 anagallis	1 pimpernel or water
2 beccaburga	2 brooklime
3 officinalis	3 officinal
4 serpyllifolia	4 smooth—*Paul's betony*
5 virginica	5 Virginian
VIBURNUM	VIBURNUM
1 acerifolium	1 maple leaved
2 arboreum *Bart.* pyrifolium	2 tall
3 cassinoides	3 thick leaved
4 cyaneum *l'Her.*	4 ———
5 dentatum	5 tooth leaved
6 lævigatum	6 smooth
7 lantanoides *Mich.*	7 hobble bush
8 lentago	8 pear leaved
9 luteum	9 ———
10 molle	10 woolly
11 nitidum	11 shining
12 nudum *Var.* squammatum	12 naked, oval leaved
13 opuloides	13 shrub cranberry
14 pimina *Mich.*	14 ———
15 prunifolium	15 plum leaved, black hued
VICIA	VETCH
1 americana	1 American
2 cracca	2 tufted
3 parviflora	3 small flowered
4 pusila	4 small
VINCA minor	PERIWINKLE small
VIOLA	VIOLET
1 cucullata *Ait.*	1 hollow leaved
2 lanceolata	2 spear leaved
3 pallida *Muhl.*	3 pale
4 palmata *Ait.*	4 palmated
5 pedata	5 multifid
6 primulifolia	6 prim rose leaved
7 pubescens *Ait.* pennsylvanica *Mich.*	7 yellow flowered
8 obliqua *Ait.*	8 oblique flowered
9 rostrata *N. S.*	9 beak flowered
10 sagittata	10 arrow leaved
11 ——— *N. S.*	11 *N. S.*

VITIS	VINE or GRAPE
1 hirsuta *N. S.*	1 hairy
2 labrusca taurina *Walt.*	2 fox
3 riparia *Mich.*	3 river or sand
4 vulpina cordifolia *Mich.*	4 winter or chicken
XANTHIUM orientale	XANTHIUM eastern
XYRIS	XYRIS
1 anceps *Pers.* jupicai *Mich.*	1 two edged
2 brevifolia	2 shorth leaved
ZANTHOXYLUM fraxineum *Willd.* americanum	TOOTH ACHE TREE common

COMMUNICATIONS

TO THE

SOCIETY

FOR THE

PROMOTION OF USEFUL ARTS.

[The following Communication was made to the Society by the President, S. De Witt, Esquire, and may be found in his treatise on Perspective, lately published.]

Drawing in Perspective Mechanically.

ADAMS, in his *Geometrical and Graphical Essays*, justly observes, that "there is no artist who will be hardy enough "to say that he can delineate *by the eye* the same object "twice with exactness, and preserve a just and similar pro-"portion of parts in each. In one of the figures we shall "find some of the parts larger than in the other; both can-"not be right; yet supposing them perfectly the same, "neither may be conformable to nature. Add to this, many "situations of an object occur, which no eye, however ha-"bituated, can represent with accuracy."

This difficulty of making true representations of objects by drawing *by the eye*, has given rise to a number of contrivances to effect the same purpose with greater exactness and ease. Among these, one of the simplest is to make a frame in the shape of a parallelogram and divide the space inclosed by it into small squares, by stretching threads across it; and to divide the paper, on which the drawing is to be made, with pencil lines, into similar squares, numbering the ranges of squares on the frame and those on the paper in the same manner. The frame is then set up perpendicular, between the eye and the objects, with a fixed sight at some distance before it through which the objects are observed, and what is seen through any square of the frame is drawn on the corresponding square on the paper; this being done through all the squares will give a representation on the paper, corresponding, in all its proportions, to the objects intended to be drawn.

In order to acquire an expertness in this manner of drawing, it will be of use for the learner to exercise himself in

copying pictures, by dividing them into squares with pencil lines, as also the paper on which the copy is to be taken, and then, *by the eye*, copying whatever is seen in each square of the picture on the corresponding square of his paper.

As a substitute for the frame just described, and with the view of having something to answer the same purpose, as portable as could be made, I have constructed an instrument of the following description, which I call a DIORASCOPE, to distinguish it from one I have called a DIORAGRAPH, that will be described afterwards, and which *draws* the outlines of pictures *mechanically*, whereas this and the frame, only *guide* the eye in making the drawing.

Figure 15, is a representation of this instrument drawn in *military perspective*.

THE DIORASCOPE.

A,B,C,D, are pieces of mahogany, or other proper material, the dimensions of which may be measured by the scale. The limbs B and D are joined to C by hinges, so as to permit them to fold down towards each other, and are kept in an upright position by the braces E,E, which move at their lower ends on pins, so that they can be folded down into the cavities F,F. A is made in the form of a frame, divided by fine threads or wires into two rows of squares, each square being half an inch. The inner edges of the frame are bevelled to the middle, and perforated with holes, to receive the dividing threads. This piece is attached to B, by slipping it on two iron pins, fastened into the top of B, at 10, 11; entering into corresponding holes in the lower part of the frame. D is perforated along its middle, with sight holes, half an inch apart from each other, countersunk on the inner side, and numbered. G is a screw packed in its place, and held down at the point by a small wire staple, and at the other end, by one end of A, resting on it, when the instrument is folded up; which is thus to be done:—Turn the braces E,E, into the cavities F,F; take off A, and

place it on C, so that the pins, *b*, *b*, enter into the holes *a*, *a*; next turn down B and D, which are of such lengths that their ends will exactly meet, and the pins at 10, 11, lie in the notches at *d*. D, when set up, has its middle nearly level with A. H shows the instrument folded up. The one from which this drawing is taken measures then one inch in thickness, an inch and a half in breadth, and thirteen inches and a half in length, made of mahogany.

I do not know of any thing contrived for a similar purpose, so portable and simple in its construction. Gentlemen inclined to amuse themselves with landscape drawing, will find it an agreeable and not cumbersome companion. The method of using it is this:

Set up the instrument as in the drawing; then, with a gimlet of a suitable size, make a hole on the head of a post or stout stake, driven into the ground, or any other proper firm supporter, and passing the screw through the hole in the middle of C, into the hole on the supporter, screw the instrument firmly to it in a horizontal position. The paper on which the drawing is to be taken, must be ruled with pencil lines into a proper number of squares, and the ranges numbered from left to right, and from top to bottom, in numerical order: then, looking through the sight hole marked 1, 2, draw the objects seen through the squares of A, on the corresponding squares of the two uppermost ranges on the paper; next, looking through the sight hole 2, 3, draw, on the third range, the objects seen through the corresponding squares on the lower range of A, connecting them with what was before drawn on the second range; and so on, shifting the eye successively to all the sight holes, till the outlines of the picture are completed, when it is to be finished in the usual way.

It is here proper to observe, that the shifting of the eye from one sight hole to another will have an effect on the drawing that will make it somewhat different from a perspective *perfectly* accurate. This difference, however, will

only affect drawings of very near objects, but in drawings of those that are at any considerable distance, it will be altogether imperceptible, and can be no objection to the general utility of the instrument.

As a cheap, convenient and ready assistant to a person whose taste may lead him to the use of such instruments, this has its merits, which those who try it will duly appreciate; but I have never seen a description of any which can so completely serve the purpose of *drawing in perspective mechanically* as the one of which I shall now give the description.

THE DIORAGRAPH.—(*Fig.* 16.)

A is a drawing board dropped into the surrounding frame, which is here represented in the form of a box, to receive the other parts of the instrument when not in use; *b*, *c*, *c*, is made in the form of the letter T, and is so called; *d*, *d*, are two pieces screwed on to the back of the frame, so that their ends join in the middle, and their upper edges form one straight line; these are then called the RAIL. To the bottom of the T, near its ends, where the letters *c*, *c*, *b*, are placed, wheels are fixed to facilitate a lateral motion: The wheels at *c*, *c*, run in a groove on the rail, and the wheel at *b* on the front edge of the frame. *e* is a piece called the PORT-PENCIL, with two wheels to its bottom, moving in the grooves *r*, *r*.—From the port-pencil a piece is extended to *f*, called the ROD, in the under part of which is a groove, to receive the edge of a wheel fixed on the T, where the leg joins the crossing part; and immediately above are two pullies, one diameter apart from each other, sinking a little into a groove on the upper edge of the rod. To the right side of the port-pencil is fixed a flat piece of brass, with the two ends bent horizontally, having holes in them exactly over each other, through which the tube, or case that holds the pencil, is to slide, with little or no friction. On the top of the pencil is placed a socket, S, from which rises a pin; circular pieces of metal, to serve as weights to give a due pressure to the pencil on the paper, with holes in the cen-

tres are slipped on the pin and taken off, according to the degree of pressure required. At *e* there is a button with a wire pin descending from it, bearing on a small concealed lever, which, when pressed down, raises the pencil from the paper. This button is pressed by a finger whenever the pencil is to be moved, without marking the paper. *g*, called the GALLOWS, is made in the form as represented in the drawing, and fastened by pressing it into a socket on the T. Its height should be at least equal to the breadth of the drawing board. At *h* a pulley is suspended from it directly over the space between the two pullies on the T. *i* is a piece to slide into and out of the frame, and fastened in the inside by a wedge. *k* is an upright cylindrical piece, pressed into a hole near the end of *i*. *l* is a horizontal piece made to slide up and down on *k*, and fastened to it at any height, by the screw *m*. *n*. is a flat piece of brass with the *sight-hole* in it, and will be the better if a ring be fastened to each side of it to exclude the light. At *o* is a weak wire spring rising from a cavity in the rod; to this spring is fastened a fine smooth thread which is carried thence, through the groove on the rod, to, and under the first pulley on the T, thence up, to and over the pulley on the gallows; thence down, under and beyond the second pulley on the T, to the end of the rod, where it is fastened, bearing a little on the spring at *o*. *p* is a mark on the thread, which may be either a small conical bead, or the knot of a differently coloured thread.

In the inside of the box there are apartments for the various utensils of drawing, besides the parts of the instrument to be packed up in it. There is also a lid or top-piece to be laid on it and secured by a lock.

From the construction of this instrument it is evident that as the pencil, with the port-pencil and rod, is moved forward, the mark on the thread will move upwards and *vice versa*; and as the pencil with the T moves to the right or left, so will the mark. All these movements being on

wheels and pullies the friction will be very little and cause no perceptible impediment to the movements of the pencil in all directions.

The DIORAGRAPH is thus used:

Fix it in a horizontal position, with a proper bearing on the objects to be drawn; which may be done by laying it on a table and fastening it with clamps, or by any other means, to prevent it from shifting. Have the drawing board prepared with paper in the usual manner; drop it into its place, which should be so adjusted that the upper surface of the drawing board be a little lower than the upper surface of the frame; then put on the T with its appendages, so that the wheels, on the cross part of it, be in the groove on the rail; adjust the sight and mark on the thread; prepare a pencil, with the point so sharpened, that it be as nearly as may be in the direction of its axis; slide it into the pencil case (which it should tightly fit) until the point project a little out of it; drop the pencil case, with the point of the pencil downwards, into its place on the port-pencil: then, looking through the sight hole, move the port-pencil so that the mark on the thread appears to move along the lines of the objects to be drawn, and the pencil will then mark on the drawing board a true perspective representation of them. The T, with its appendages, is then removed, the drawing board taken out, the irregularities of the pencil lines corrected, and the drawing finished in the usual manner. Thus may true perspective drawings of any objects be made, with nearly as much facility as copies of pictures are taken, by laying paper on them and tracing on it the lines of the original, seen through it when held up to the light.

At first some awkwardness will be experienced in moving the pencil, so that the *mark* shall follow the lines to be drawn; but, after a little practice, it will be as easy as to follow the lines of a picture laid on a table before you, and can be done with equal expedition.

Although I would by no means recommend it as a proper practice, to attempt drawing, without first obtaining a complete knowledge of the elements of perspective, still as there may be many, and especially among the young ladies, to whom every polite accomplishment is intended to be given, who may not find it convenient to pass this ordeal, I know of no better assistant for them than this instrument.—They will find, in the use of it, the most ready means of obtaining the outlines, in perspective, perfectly accurate, not only of landscape views, but also of many other things, in the drawing of which they will find much amusement; and receive much gratification from seeing and exhibiting what they have performed by means of it, as resemblances more perfect than what are generally produced. The furniture of rooms, such as chairs, tables, sophas, sideboards, and also articles of dress, such as hats, caps, and any thing else that can be placed stationary before the instrument, may have their outlines drawn by it in the most correct perspective, and with the greatest facility.

PAPERS

FROM

E. C. GENET, ESQ.

Member of the National Institute of France, of the Royal Antiquarian Society of London, of the Literary Academies of Sweden, of the Mineralogical Society of New-York, and one of the Counsellors of the Society for the Promotion of Useful Arts.

COMMUNICATED IN 1810.

[No. 1.]

Remarks and Notes on Colours.

COLOURS are to the eye what sounds are to the ear, flavor to the taste, odour to the smell, and forms to the touch. A parallel might be drawn between those several feelings, and many curious experiments have been made in order to convey to our interior perception, that idea which comes the nearest to the one which a native deficiency of organization prevents being conducted and depicted in that mysterious *camera obscura*. The following anecdote corroborates this observation.—When the Emperor of Germany, Joseph the Second, visited France under the reign of Lewis the XVI. he viewed with peculiar attention the celebrated school of the Abbe De L'Epee for persons born deaf and dumb, and wishing to know what idea men deprived of hearing from their birth could have of sounds, he wrote himself the following question, which was presented to the most intelligent scholar. "What is your conception of the sound of a trumpet and of a flute?" and the immediate answer was, "I im-

agine by what is reported of the sharp and acute sounds of the trumpet, that it must affect the ear as the scarlet colour affects the eye; and that the music of the flute must be among sounds what the rose is among the flowers."

This single fact throws more light on the theory of sensation than the most elaborate dissertation on that subject, and seems to indicate the rules which are to be observed to procure us earthly pleasures by the intervention of our senses.

Irritation is unquestionably the basis of their action, and they are affected agreeably or disagreeably according to their affinity with the things in contact with them. The study of those affinities constitutes taste, and is as indispensible a branch of the art of the dyer or painter as it is one for the art of the cook, the confectioner, the perfumer, the musician, and all the arts calculated to procure agreeable sensualities.

In degustation acid substances, irritating too much the palate, create an unpleasant sensation; very mild or sweet ones do not always delight, but the sour and the sweet combined, as nature has done it in the orange, and art in the lemonade, refreshes agreeably, and by checking the thirst produces pleasure.

The essences of spices alone, are heating, but combined with oil, fat or butter, they become a great addition to the pleasure of the table. Odours operate in the same way. The volatile spirit of amoniacal salt or hartshorn is too poignant, but modified by an essential oil, as in the *eau de luce*, it is friendly to the cephalic nerves.

Musk, which is offensive in its crude state, united with the essential oil of flowers, becomes a luxury.

The forms of substances have also more or less affinity with our feelings: acute angles, sharp edges and dry joints are repulsive; whilst round, smooth, fresh and elastic bodies are gratifying to the touch.

Our sensations appear to be essentially ruled by irritation,

and the scale of their different degrees of irritability, from the lowest to the highest, would perhaps be the scale of physical pleasure and pain. Though observation and practice have marked a few degrees of this scale, science has not yet fixed them all with precision. Music comes nearest to it by the rules of harmony and melody, and a musician endowed with genius, can by the combination of sounds, movement, time, and a stronger or weaker collision of the air, occasioned by instruments or voices, awaken or [illegible]en the feelings upon which he has intended to work.

The pleasure which the eye derives from colours has also its source in irritation and affinity, and the talent of the dyer is to prepare and set those which captivate most the sight and enhance the fanciful value of manufactured textures. That art has been very much improved in the old countries, and very much neglected in America, except among the natives, who possess valuable secrets to enliven by brilliant and durable colours, extracted from plants, their beeds and trinkets, their weapons, their clothes and their baskets, or to give to their features when they go to war a more dreadful appearance.

The citizens of the United States have hitherto paid very little attention to colours, and the art of the dyer is here yet in its infancy.

The various specimens of cloth which have obtained the premiums of the society for the promotion of useful arts, offer nothing but dark shades, the reflection of which is dull and gloomy. We must not however be too severe and require perfection from beginners. It is but lately that the people have found that they were no more colonies, subject to the mercantile and manufacturing monopoly of other nations. Patriotism has but within a few years induced them to unite the manufacturing system to the agricultural. The most astonishing success has crowned their efforts; their cloths, particularly since the introduction of Spanish sheep, have become equal in quality to the best imported cloth,

and nothing will contribute more to further their progress but to improve the colouring of their wool and cotton goods.

The art of the dyer has also been a great while neglected in Europe; and abandoned as it has been in America, to the care of common practitioners, unguided by chemistry and untutored by taste, and as long as government suffered it to be so, it remained stationary; but as soon as philosophy enabled this art to draw from mineral, vegetable and animal substances their colouring particles, and to apply them unchanged through the mediation of proper mordants to wool, cotton, linen and silk, their manufactures have been vastly promoted. Colouring principles are useless if they are not rendered durable and unchangeable by proper mordants. Those mordants are different kinds of salts with which the dying principles are amalgamated, and their effect is such that colours which deprived of their mediation would change when exposed to the air, or would be washed away, are by them set and fixed so steadily, that even vegetable acids cannot alter them.

The vitriolic, aluminous, and alkaline salts had for many years been used as mordants, but none of those substances have been universally successful for all sorts of colours, and they have altogether failed to make the true scarlet. But by the ingenuity of the French chemists employed to superintend the royal manufactory of the Gobelins, that valuable colour, the secret of which was thought to have been buried under the ruins of Tyre, was procured: Macquer used for that purpose the solution of tin by the aqua regia, and with the same mordants he engendered a variety of other handsome red colours, from cheaper and more common ingredients, extracted from the vegetable and animal kingdom. The Asiatics who are not acquainted with the use of that solution, employ with great advantage as a mordant, a solution of fixed alkali or soda with a solution of alum, and I am satisfied that the same mordant applied to

several roots, fruits or barks of this country would produce the most elegant colours.

America supplies Europe with several articles used for dying, and possesses many others kept secret by the Indians or used by private families for their own good. I have collected all the information I could on these native dyes, and thinking that the friends of science must be liberal, and that concealment and philosophy ought to be as far distant as the arctic pole is from the antarctic, I shall offer here the result of my remarks on a great variety of vegetable colours which I have tried, and I shall conclude these notes by a description of the method used in France to make the solution of tin, and to procure with the assistance of that invaluable mordant the best and most durable scarlet, dark blues and black.

List of native vegetable substances which contain colouring principles, and the mordant which will best set them.

Vegetables.	*Colours.*	*Mordant.*
Poplar,	Yellow,	Alum and soda.
Apple trees,	do.	———
Locust,	do.	do.
Persimmon,	Crimson,	do.
Oak trees,	Steel colour,	Copperas.
Nut trees,	Olive,	do.
Maples,	Purple,	do.
Sassafras,	Red,	do.
Madder,	do.	do.
Stone fruit trees,	Cinnamon and nankeen colour,	Alum and soda.
Sumac, hazel nut and alders,	Black,	Copperas.
Woad,	Blue,	Solution of tin.
False Indigo,	do.	do.

Several fruits yield also very handsome colours, with proper mordants. The berries of the Pokeweed or Pigeon berry (Phytolacca) give an elegant red equal to the Cochineal. The blue Huckleberry or Whortleberry (Vaccinium)

gives a blue superior to the Mazarine, and the winter Grape, resembling very much the dyer's Grape of the French, called *noireau*, gives the finest violet.

SOLUTION OF TIN.

To prepare this mordant, the French chemists take two parts of spirit of nitre and one of fuming spirit of salt. They dissolve in this liquor the purest tin that can be procured, they granulate it and throw it by degrees in the mixture. The quantity of tin must be to that of the liquor as one to twenty, though more tin may be added if the liquor will dissolve it. To use this mordant it must be diluted in two or three parts of clear stream water according to its strength, until it is found to have the acidity of vinegar or lemon juice.

SCARLET.

To make the best scarlet, three parts of water to one of solution of tin are mixed together, and to procure the different shades and varieties of light red, rose, and orange, the quantity of cochineal and mordant must be reduced.

BLUE.

To give a dark and unchangeable blue colour to wool, the French and German manufacturers mix one part of pulverised indigo of the best quality with eight parts of vitriolic acid, well concentrated, and leave it without being disturbed twenty-four hours. They then add by degrees to the mixture ninety-six parts of pure and soft water, and stir it repeatedly. The wool dipped into it comes dyed with a dark blue colour. If the colour, however, is too dark, and approaches too much to the black, it may be rendered lighter by soaking the wool or cloth a whole day in a bath composed of twenty-four parts of pure and soft water and one part of sea salt well dissolved and cold. Alum may also be used as a mordant for indigo, and if wool or cloth are immerged after it has been died with that mordant in a bath containing a solution of soda, it will acquire

a darker colour. The same method will apply to silk, but not at all to linen and cotton.

BLACK.

To make a handsome black, the wool must first be dyed blue and afterwards blackened with the usual ingredients. The pericarpium or husk which covers the hazel nut when green, is used in France in preference to any other substance to procure a handsome black. The husks of our nuts and the witch hazel (hamamelis virginica) might equally be used to advantage; but the hazel nut husk, if they could be collected in sufficient quantity, would be far preferable.

[No. 2.]

On the economical utility of the Apocinum Cannabinum, or Indian Hemp, and the Asclepias, or Milkweed, natives of the State of New-York.

THESE plants belong to the second section of the 5th class of Linnæus, and they have been divided by that father of the sexual system in two separate genders. The first (apocinum) deriving its name from the Greek (αποκυνος) or kill dog, on account of its being considered as a poison for those animals; and the other from Esculapius on account of the medical virtues of its roots, used by the ancients as the best antidote or contra-poison; but our American farmers, inattentive to the botanical characters of the plants, comprehend indiscriminately the different species and varieties of apocinum and asclepias under the common denomination of

silk, cotton or milk weed, derived from the milky substance which they contain, and of a kind of vegetable silk or cotton connected with the seed in their pods.

Leaving for the investigation of the chemists the medicinal virtues of the roots and juices of these plants, and particularly of the *asclepias albo flore*, the extract of which was ranked among the most powerful agents of the art of healing, before fashion, which rules the physician as well as the rest of the world, had almost entirely discarded the vegetable and substituted to them the mineral, I will consider only in this communication the economical benefits which might be derived from the cultivation of the asclepias syriaca or silk weed; and of the apocinum cannabinum or Indian hemp.

The silk weed grows all over the state, on upland, in a straight stem from two to three feet high, the top of which is crowned by several bunches of small white and purple blossoms, sweet scented and abounding with honey, from which originate large pods containing a vegetable silk which adheres to the seed, and seems intended by nature to carry it like wings through the air, to spread and multiply it on the surface of the earth.

The silky substance collected from that plant is used in France with great advantage, and is cultivated under the name of *houatte* or *wadding*. They card it, spin it, and manufacture it into velvets, cloths and hose, with or without the intermixture of cotton or silk. It is also used for wadding to stuff quilts and counterpanes, and for that purpose it is far preferable to cotton, being warmer and lighter. To card it by itself they expose it in bags to the steam of water, but mixed with silk or cotton it does not require the intervention of the steam to be made into rolls and spun. The velvets and other textures made with that vegetable silk which I have seen in Europe, resembled, if not excelled the brilliancy of the silk, and with proper mordants had received the most elegant colouring.

The apocinum, or Indian hemp, grows profusely on our low lands. Its blossoms like those of the silk weed are pur-

ple, and the pods contain also a quantity of silk, though less than the silk weed. But the coat of its stem is far superior in strength to the hemp. I caused to be water rotted a considerable quantity of it in 1814, and obtained an excellent hemp as white as snow, remarkable for its strength, which proved to be double to that of the common hemp.

I have been informed that the Indians, called Mowhicanes, who formerly inhabited the land where my plantation is situated at Greenbush, on the east bank of the Hudson river, below Albany, made a great use of this plant, and not many years ago were still in the habit of coming from the distant place where they now dwell to collect it. Several of my oldest neighbors have assured me, that the ropes and yarn which they made from the fibres of that plant, were far superior for strength and durability to those made of flax or hemp. That sort of apocinum being perennial could be cultivated and multiplied with the greatest advantage, and being more natural to low and overflowed lands, could render profitable certain pieces of ground which are now totally unproductive.

The apocinum *cannabinum* in its natural state, growing on sods and in bogs, is lower than the silk weed, but cultivated it would probably grow larger and liberally reward the attention paid to its improvement.

P. S. Since this communication was presented to the Society, I have been informed that a French gentleman, who attends the dyers' department of the manufactory of Mr. Lynch, at Rome, has discovered that the leaves of the asclepias, and probably of all the apocinums, were an excellent substitute for the woad. Dr. Low, of Albany, has also observed that the milky juices of the asclepias were equal if not superior in many respects to the opium extracted from the white poppy. It is to be hoped, for the good of the community, that those gentlemen will soon publish their important discoveries.

[No. 3]

On the use of Milk to regenerate decayed Sheep, and for other purposes.

THE simplicity of the method recommended in this essay to regenerate decayed sheep, ought not to militate against it. The more we follow nature in her plain and easy ways, and the more we study and imitate her laws, the more we approach truth and avoid the deception of sophistry and error.

I purchased in 1810 an imported merino ram: This animal was low in flesh, his eyes looked drooping, and it was apprehended that his existence would be but short. A number of things were recommended to me to restore his strength, but as I had little time to devote to his improvement, the season being advanced, I thought best to make him take warm milk from a handsome young heifer, which was appointed his nurse. He soon became very fond of that beverage and in a short time he has been able to serve a flock of two hundred ewes. Milk was not, however, his only support; he was during his restorative treatment kept on a small piece of grass and ate twice a day about a quart of rich wheat bran. The idea of employing milk for the restoration of this animal came to me by the recollection I had of the great use made by the French physicians of that emulsion in cases of debility and decay. They generally prescribe cows, goats, or asses' milk. But the celebrated M. Delamure, professor of physic of the university of Montpelier, observing with reason that women's milk was more congenial to our system, he employed it with the greatest success in cases of emaciation and marasmus. He even recommended to his patients to suck that excellent restora-

tive from the breast, in order to make them receive without deperdition the volatile spirits and the natural heat it contains. The milk of the females of several species of beings including ours, differs but little, though women's milk is admitted to be the most nutritive and agreeable. It is of an easy digestion, it restores in a short time the vital and muscular faculties, but in cases of a vitiated system or of deep consumption, a sucking bottle ought to be substituted to the lips of the patient in order to protect the nurse, who would infallibly be infected by the same disease that affects the patient. As to my old ram, not to forget him after this digression, he was perfectly contented with his heifer's milk, which he took in a pan; I think however that ewes' milk, if it could have been procured, would have answered better on account of its greater affinity and congeniality.

A circumstance worth noticing here is that almost all the sheep which came from Spain with my ram, have been subject to the scab, whilst mine during all the time he used the milk was clean of that dangerous cutaneous complaint. The scab being a scorbutic affection of the blood, milk must in reality be an excellent specific against it on account of the great quantity of vegetable acid and salt contained in its serous part. The cowherds on the Alps and in several parts of France use milk whey to make the sharpest vinegar, and they also extract from it a salt called in pharmacy sugar of milk, which the Swiss doctors consider as the best detergent to purify the blood and cure radically the most inveterate cutaneous complaints. The method they use to prepare this salt is this: after having separated all the caseous and oily parts, the whey is clarified and boiled until reduced to one fourth part of the whole, which they deposit in wooden or earthen pans in a cool place. In a short time the saccharine particles are crystallized, the phlegmatic part is then decanted slowly and the sugar is dried upon pieces of grey paper. This operation may be accelerated by boiling out the whey entirely, but the sugar which re-

mains at the bottom of the kettle is coloured and unfit for pharmaceutical purposes: it might however answer well for veterinary uses.

The process for making vinegar out of milk is very simple. After having clarified the whey it is poured into casks with some aromatic plants or elder blossoms as it suits the fancy, and exposed in open air to the sun, where it soon acquires an uncommon degree of acidity.

The Russians and Tartars make with the whey of their mares' milk a strong and intoxicating liquor, which they call Koumis, and also vinegar, by suffering that substance to pass from the vinous to the acetous fermentation.

LETTER

ON

CHIMNEY FIRE-PLACES,

ADDRESSED TO

ROBERT R. LIVINGSTON, L. L. D.

President of the Society for the Promotion of Useful Arts,

BY BENJAMIN DE WITT, M. D.

Professor of Chemistry in the University of the State of New-York.

Albany, Dec. 10th, 1810.

DEAR SIR,

I THINK I mentioned to you last winter that I had fitted up a fire-place in a very advantageous manner, by which much fuel was saved and a great increase of heat produced. The return of the cold season brings this subject forcibly to my mind; and where fuel is expensive every improvement in this branch of domestic economy becomes of public importance. I propose then in this letter to give you a description of several fire-places constructed on the principle applied to mine; together with some observations on the usefulness and importance of that principle, when put into successful operation.

Whenever a fire is kindled in an ordinary open fire-place, the heat generated by the combustion of the fuel escapes in three different ways:

1st. A considerable quantity ascends the chimney in a state of *combination* with the air, vapor and smoke created by the fire. This is called *combined heat.*

2d. A large portion is absorbed by the hearth, back and sides of the fire-place, and is conveyed away through the walls by means of the *conducting* property of the materials composing it. This is called *conducted heat.*

3d. A part of the heat flies off in direct *rays* into the room, immediately from the fire, and also from the heated walls around it. This is *radiated heat*.

Now it is evident that nearly all the heat passing off in the two first mentioned ways is actually lost, and does not contribute to warm the room. Count Rumford thinks it "quite certain that the quantity of heat which goes off *combined* with the smoke, vapor and heated air, is much more considerable, perhaps three or four times greater than that which is sent off from the fire in *rays*." And with respect to the *conducted heat*, I am confident that of this also, a greater quantity passes away through the walls in contact with, and near the fire, than is thrown into the room by radiation. The truth of this observation will be sufficiently established, when it is found in the sequel, that by the aid of this conducted heat a room may be warmed with half the ordinary quantity of fuel. It appears then from these data, that but a very small proportion of the heat given out in a common fire-place comes into the room. The greatest part is dissipated without any advantage; and much fuel is consumed to no purpose.

Count Rumford, speaking of the radiated heat issuing from a fire, says, "Yet small as the quantity is of this radient heat, it is the only part of the heat generated in the combustion of fuel burnt in an open fire-place which is, or *ever can be employed* in heating a room." Here, however, in the latter part of this remark, the Count evidently labors under a great mistake; for although the *latent* and *insensible* heat contained in the volatile materials ascending the chimney cannot easily be extricated and employed in warming a room, yet the *free* and *sensible* heat carried up by the vapor, smoke and air, may be brought back into the room, without difficulty, and made to contribute much to its warmth. In the Transactions of the Society for the Promotion of Agriculture, Arts and Manufactures of this State, published in 1799, there is an Essay on Warming Rooms, by Simeon

De Witt, in which a method is described to accomplish this object. The *conducted* heat, also, which is usually carried away through the hearth and walls of a fire-place, may certainly be prevented from being lost. By a very simple contrivance, on the most obvious principle, it may be conveyed into the room, and employed in warming it with great profit. It is to the means of doing this that I wish particularly to invite your attention.

The burning of fuel in every fire-place, by heating and rarifying the air around it, always produces an ascending current in consequence of which, much air is constantly carried out of the room. Whatever quantity escapes in this way, the same quantity must come into the room some other way, to supply its place. If the room is so tight that the external air can find no admittance into it, there will be no current ascending the chimney when a fire is kindled, and the whole apartment will be soon filled with smoke. This necessary quantity of air, usually enters into rooms through apertures in the doors, windows and floors; by which means the air of such rooms, in cold weather, is cooled nearly as fast as it can be warmed by the fire. Now it is plain that if you can admit the requisite quantity of air through openings somewhere about the walls of your fire-places, where it will be heated before it is introduced into the room, and then make your doors and windows perfectly close, a double advantage will be gained. Much heat from the fire will be obtained, which otherwise would be lost, and the room will be constantly receiving warm air instead of cold; the consequence of which will be that the remotest corners of your apartment will be of a uniform and agreeable temperature. There will be a free circulation of fresh, but warm, air; and much less than the ordinary quantity of fuel will be sufficient to keep you comfortable in the coldest weather.

With these views, my brother, Mr. Simeon De Witt, whom I have already mentioned, had a close stove constructed, which he has used for two or three years past with

great satisfaction. He closed his common fire-place by a wall built across it. Near this wall, and in front of it, he placed a small close stove, of a peculiar construction, and surrounded it with a white marble case, having an opening in the upper part of the front. The external cold air was admitted through a perforation in the hearth under the stove, passed up around it, within the marble casement, and issued warm into the room from the opening in front made for that purpose. The white marble, while it added to the beauty of the structure, protected the stove from the dust, which in other cases, by burning on the heated iron, gives a disagreeable smell to the air. He then made his doors and windows tight, and the effect was, that with a very small quantity of fuel, in the midst of winter when the thermometer stood at 10° or 15° below 0, he enjoyed, in his room, a fine fresh summer atmosphere.

But as close stoves are not so lively and pleasant as open fire-places, I undertook to apply this principle to a common Franklin stove; and accordingly procured a small one cast with a flue projecting horizontally about four inches beyond the back. After closing my common fire-place by a straight wall, I placed this stove about two inches in front of it, and elevated about the same distance from the hearth. The flue entered of course about two inches into the wall. The opening around the edge of the hearth-plate was then shut, so as to inclose the vacuity underneath, and the same was done as to the space behind the back of the stove. The external air was admitted through a hole previously made in the floor under the front semicircular part of the hearth plate. The current entering there spreads under the whole of the bottom, and behind the back, and issues into the room through openings for that purpose at the side of the stove. This air brings with it all the heat from the plates, which otherwise would be conducted away, and no cold air from without requires to be admitted. The room in which I have this small fire-place is large, with the doors of two smaller rooms

opening into it, all of which are kept comfortable and pleasant, in the coldest weather, with less than half the ordinary quantity of fuel.

Many people, however, dislike even Franklin stoves; and it occurred to Doctor Charles D. Cooper, of Albany, that this principle might be applied without difficulty to fire-places of the ordinary shape and appearance; he accordingly had four plates cast, which, when put together, form a fire-place on the model of Count Rumford's. The hearth plate is let down on a level with the hearth stone in front of it. The ends of this plate and its front edge are supported on bricks, and there is a vacuity under the remainder of it, as well as behind the back and sides. From the upper edge of these plates the wall of the chimney is carried up, so as to close the opening above, and prevent the air behind the plates from going up the chimney. The cold external air is brought by a tube four or five inches in diameter from the nearest window, or any other aperture under the floor of the room, and is admitted through an opening under the front part of the hearth plate. This air spreads under that plate, and behind the back and side plates, and enters the room through horizontal perforations about five inches in diameter through each of the jambs, two or three feet above the floor. This fire-place does not differ in external appearance from a common Rumford, lined with cast iron plates. But the manner of putting it up, so as to bring all the heat absorbed by the plates into the room, and at the same time to preclude the necessity of cold air being admitted by the doors and windows, gives it a great and decided preference. Doctor Cooper considered this fire-place so valuable and excellent that he has obtainad a patent from the United States for its construction. His patent, I am informed, extends also to *Coal Grates* put up on the same principle. A coal fire, you know, usually creates a more intense heat at the wall behind it, than in front where the cold air enters. While the greatest part of the radient heat

is intercepted, by the dead embers at the outside of the fire, the wall against which it burns will be red hot, and that heat is constantly conducted away, unless it is intercepted by some such means as I have described. Grates may therefore be constructed in this manner with peculiar profit and advantage.

The principle, however, on which the fire-places I have described are constructed, is by no means new; nor is the practical application of it to the warming of rooms original. I find that Doctor Franklin put it in practice sixty-five years ago. Yesterday for the first time I had the pleasure of reading the description of his Pennsylvania fire-place, published in 1745. To the back of the Franklin stove now in use, there was attached what he calls an *air box*, into which the cold air was received from without, and discharged warm into the room. The flame and smoke passed over this air box, descended behind it down to the hearth, and then ascended the chimney. He conjectured that ten barrels of heated air were by these means brought into his room every hour. If he was correct in this, no doubt his contrivance was successful; and I can only account for its not coming into general use, from the circumstance of its being too complicated in its structure, to be managed or understood, by the common class of people. If these difficulties were the true cause of Doctor Franklin's original Pennsylvania fire-place being laid aside, I think they are obviated in a great measure by the simplicity of my method of putting up his open stove. It is attended with no more trouble, expense or difficulty, than any other common method; and the benefits derived from it are incalculably greater.

In 1783, Doctor Franklin, in his letter to Doctor Ingenhausz, adverts to this principle as applicable to common fire-places, in the following words: "M. Gauger, a very ingenious and intelligent French writer, proposes with judgment to admit the air above the opening of the chimney; and to prevent inconvenience from its coldness, he di-

rects its being made to pass in its entrance through winding cavities made behind the iron back and sides of the fire-place, and under the iron hearth plate; in which cavities it will be warmed and even heated, so as to contribute much, instead of cooling, to the warming of the room. This invention is excellent in itself and may be used with advantage in building new houses; because the chimneys may be so disposed as to admit conveniently the cold air to enter such passages; but in houses built without such views, the chimneys are often so situated as not to afford that convenience, without great and expensive alterations." The difficulty here suggested by Doctor Franklin seems to me to be altogether avoided in the method of putting up such fire-places, proposed by Doctor Cooper. The plates may be adapted to almost every common fire-place, and all that is necessary in addition to this, is to make a perforation through each of the jambs, and one through the wall on which the hearth rests; from which last a tube is extended, commonly under the floor, to the most convenient place where it can reach the external air. Many of these fire-places have already been introduced into a variety of rooms in this city, at an expense comparatively small, and without any difficulty, in adapting them to every common fire-place. Two of them have been lately made in the Senate chamber, by the commissioners superintending the building of the Capitol. And on the whole, considering the prevailing taste for open fire-places on the Rumford model, connected with the comfort to be derived from admitting warm, instead of cold air into rooms, and the great economy of fuel in consequence of that arrangement, I am persuaded that this fire-place is the best that has hitherto been contrived; and is well calculated for general use. The essence of the improvement made by Doctor Cooper consists in *the application of Franklin's principle to Rumford's fire-place, combining all the advantages of both*, which had never before been successfully accomplished.

Since the time of Doctor Franklin frequent and various attempts have been made to put his principle into operation. Fifteen or twenty years ago, I am informed, the late General Schuyler of this place, endeavored to apply it to a hall stove in his house, and also to one in Mr. Stephen Van Rensselaer's house. Three or four years ago, in travelling through New-Jersey, I saw several fire-places of cast-iron, said to be patent, erected with a view to derive the benefit of this principle. And with the same views Pollock's patent stove, and Gould's patent fire-place have been constructed. But the public have been disappointed in all these inventions. They have failed to produce the desired effect, from a radical error in the structure of the fire-places; and their error seems to have prevailed universally. The passages for the admission of air, in every instance, have been much too small to supply the requisite quantity of it. In some, the apertures for this purpose are not more than one inch in diameter; and they are nugatory in their effect. It is essential to the successful operation of fire-places of this kind, that there should be a due proportion between the openings for the introduction of air, and the opening or *choke* of the chimney by which it goes out of the room; for if the windows and doors are perfectly closed, as much air must necessarily come in at the former as escapes at the latter. If the room is tight, and the tubes for the admission of air are too small, but little heat and little air will come into the room; the chimney will not draw sufficiently, nor will the fire burn well. If on the contrary the tubes are too large, the air will be admitted too freely. It will pass in before it is sufficiently heated, increase the draught of the chimney unnecessarily, and produce too great a circulation of the cold air. So far as I can judge from observation and experience, the circular *opening*, for the admission of the *cold* and *condensed* air under the fire-place, should not be less than five inches in diameter; and the *heated* and *rarified* air should be admitted from thence into the room by at least

two tubes of the same diameter. It is a good precaution always to make them rather too large than too small, for the quantity of air admitted into the room may then be regulated according to circumstances, by registers for that purpose.

I do not know that any one has put this method of warming rooms into complete and successful operation except Doctor Franklin in his original Pennsylvania fire-place; Mr. Simeon De Witt in his close marble fire-place; myself in the common open Franklin stove, and Doctor Cooper in his cast iron Rumford. It is unaccountable to me, that such a plain, obvious and important principle should have been so much neglected in practice—A principle too, demonstrated by experience to be valuable and practicable, more than half a century ago. And above all it is a matter of astonishment that Count Rumford, in all his ingenious speculations, should have overlooked one of the most beneficial means of warming rooms and neglected entirely the suggestions of the American philosopher.

I am, sir, respectfully,

Your most obedient servant,

B. DE WITT.

To R. R. Livingston, Esq. *President of the Society for the Promotion of Useful Arts.*

On the Cultivation and Manufacture of Woad.

Ballston, March 28th, 1814.

Dear Sir,

Believing that the cultivation of the Woad plant in this country, may be very useful in our woollen manufactures, and a profitable branch of husbandry hereafter, I take the liberty of transcribing a paper on the cultivation and manufacture of Woad, by Mr. John Parish, extracted from the Bath and West of England Agricultural Society's papers of 1811.

I am, Sir,
With great esteem,
Your obedient servant,
WM. W. MORRIS.

Simeon De Witt, Esq.

Woad is a plant which combined with Indigo gives the best and most permanent blue dye hitherto discovered. It is of great importance to our commerce as well as agriculture, being in nature one of the best preparers of land for a corn crop that has hitherto been discovered; and if the land is properly chosen for it and well managed, will be found very profitable, more particularly at this time when its price is advanced to an almost unprecedented degree; therefore I conceive that in rendering its cultivation and preparation better known and understood it may be greatly beneficial to the nation.

I have the honor to be a member of the Bath and West of England Agricultural Society, where many noble and exalted characters unite their talents to promote the public

benefit. And to one of its earliest and most respectable members I presume to address this information.

I have been many years a considerable consumer of Woad; and have also cultivated it with much success; and though I am well experienced in the usual method of its preparation, I was induced to depart from it in consequence of the great waste of its juices in the old method of grinding and balling, but I shall endeavor to give instructions for carrying on each process and leave those who shall undertake it to proceed as they think best.

This plant is cultivated in different parts of England for the use of the dyers as well as in France, Germany, &c.— It is best to sow the seeds in the month of March or early in April, if the season invite and the soil be in condition to receive it; but it requires a deep loamy soil and is better still with a clay bottom such as is not subject to become dry too quickly. It must never be flooded but situated so as to drain its surface that it may not be poisoned by any water stagnant upon it.

If meadow land can be procured at a reasonable price, it ought to be done. By breaking the turf, it will be rendered doubly productive. This land is generally freest from weeds and putrid matter, though sometimes it abounds with botts and snails. However it saves much expense in weeding; and judicious management will get rid of those otherwise destructive vermin. A season of warm showers not too dry or too wet gives the most regular crop, and produces the best Woad. If Woad is sown on corn land much expense generally attends hoeing and weeding; and here it will require strong manure, though on leys it is seldom much necessary, yet land cannot be too rich. On rich land, dung should be avoided, particularly on leys, to avoid weeds; some people sow Woad as grain and harrow it in, and afterwards hoe it as turnips, leaving the plants at a distance in proportion to the strength of the land; others sow it in ranks by a drill plough, and some dibble it in (in quincunx form by a

stick with a peg crossways, about two or two and a half inches from the point according to the land) putting three or four seeds in a hole and these holes to be from twenty inches to two feet apart, according to the richness of the land; for good land, if room be given, will produce very luxuriant plants in good seasons; but if too nearly planted so that air cannot circulate, they do not thrive well: attention to this is necessary in every way of sowing it. I have been most successful in this last process. Woad very often fails in its crop from the land not being in a condition, or from want of knowing how to destroy the botts, snails, wireworms, &c. that so often prey upon and destroy it, as well as from inattention to weeding, &c. Crops fail also from being sown on land that is naturally too dry, and in a dry season; but as the roots take a perpendicular direction, and run deep, such land as I have described (with proper attention to my observations) will seldom fail of a crop: and if the season will admit sowing early enough to have the plants strong before the dry weather comes on, there will be almost a certainty of a great produce.

These plants are frequently destroyed in the germination by flies or animalculæ, and by grubs, snails, &c. as before observed; and in order to preserve them, I have steeped the seeds, with good success, in lime and soot, until they begin to vegetate; first throwing half a load of flour lime on the acre, and harrowing it in. Then plant the seeds as soon as they break the pod, taking care not to have more than one day's seed ready; for it is better to be too early than to have their vegetation too strong before it is planted, lest they should receive injury; yet I have never observed any injury in mine from this, though I have often seen the shoot strong. Either harrows or rollers will close the holes. If the ground be moist, it will appear in a few days, but it will be safe and a benefit to the land to throw more lime on the surface, when, if showers invite snails and grubs to eat it, they will be destroyed, which I have several times found;

particularly once when the leaves were two inches long and in drills very thick and strong, but the ground was dry.—When a warm rain fell, in less than two hours I found the ranks attacked by those vermin on one side and eaten entirely off by a large black grub thousands of which were on the leaves, and they cleared as they went, not going on until they had destroyed every leaf where they fixed. They had eaten six or seven ranks before I was called by one of my people to observe it. Having plenty of lime, I immediately ordered it in flour to be strewed along those ranks which were not injured; this destroyed them in vast numbers and secured the remainder. Another time having had two succeeding crops on four acres of land, I considered it imprudent to venture another. However as the land after this appeared so clean and rich, I again ventured, but soon found my error. On examining the roots (for after it had begun to vegetate strong, it was observed to decay and wither) I found thousands of the wire worm at them entwined in every root. I immediately strewed lime (four loads of six quarters each on the four acres) and harrowed it; rain coming on soon after it washed the lime in and destroyed them all, and gave me an extraordinary crop; but the first sown side of the field where they had began never quite recovered like the rest. I am fully satisfied that when the grub is seen in wheat, &c. the same treatment (if the weather suited) would destroy them all as well as change the nature of the land. I need not venture on the wide and extensive field of observations on the causes of weeds and grubs, &c. (which so often counteract the labors of the husbandman) that occur so differently in different seasons and after different treatment and improper crops—further than to observe, that when your land has *not a proper change* then it is that these are experienced in a most destructive degree.

It is in vain to expect a good crop of Woad of a good quality from poor and shallow land. The difference of produce and its value is so great that no one of any expe-

rience will waste his labor and attention on such lands upon so uncertain a produce. Warm and moist seasons increase the quantity every where, but they can never give the principle which only good land affords. In very wet seasons, Woad from poor land is of little value. I once had occasion to purchase at such a time, and found that there was no possibility of regulating my vats in their fermentation, and was under the necessity of making every possible effort to obtain some that was the produce of a more genial season. I succeeded at last: but I kept the other three and four years when I found it more steady in its fermentation; but still it required a double quantity, and even then its effect was not like that from good Woad.

At this time several dyers experienced much difficulty, and one of eminence in the blue trade suffered so much by Woad of his own growth that he declared his resolution to decline the trade altogether. When I pointed out to him that it was the Woad that occasioned his bad blues, and that I had from the same defect purchased such other Woad as would do, and informed him where he could get it, he succeeded as usual; his own he disposed of to a dry salter, who sold it again somewhere in the country; and it occasioned such a cause of complaint as I believe rendered the claim of payment to be given up or partly so: of this I am not certain, having it only from report. I mention this in order to give those who wish to become growers of Woad such information as may properly direct them.

The leaves of Woad, on good land, in a good season, grow very large and long, and when they are ripe shew near their end a brownish spot inclining to a purple towards its centre, while other parts of the leaves appear green but just beginning to turn of a more yellowish shade; and then they must be gathered or they will be injured. Woad is to be gathered from two to four and even five times in the season, as I once experienced (it was an early and a late season) and for the next spring I saved an acre for seed of

which I had a fair crop. I picked the young seedling sprouts off the rest and mixed with my first gathering of what was newly sown. This was very good; during one season I let these shoots grow too long; the consequence was that the fibrous parts became like so many sticks and afforded no spontaneous juices. When you design to plant Woad on the same land the second season, it should be as soon as your last gathering (before winter is finished) be ploughed; that is as soon as the weather will permit, and in deep furrows or ridges to expose and ameliorate it by the vegetative salts that exist in the atmosphere and by frost and snow. This in some seasons has partly the effect of a change of produce; but if intended for wheat, the last gathering should not be later than September.

The land after Woad is always clean, and the nature of the soil appears to be greatly changed in favor of the wheat crop; for I have always experienced abundant increase of crop after Woad when sown to corn, and observed that it held on for some time if proper changes and good husbandry were attended to. Keeping land clean from weeds certainly produces an increase of corn, but in the hoeing and gathering Woad (for hoeing and earthing up the plants often renders them abundantly more prolific, even if there are no weeds) many nests of animalculæ are destroyed, as well as grubs and insects which are destructive to vegetation; all this is favorable to corn, but I am disposed to believe that Woad in itself furnishes such a principle of change in favor of corn (and wheat in particular) as in a high degree to merit the attention of that Society who are so honorably united to promote and encourage the first interests of the community.

Having said all I conceive necessary on the cultivation of Woad, I now proceed to say something on its preparation for the use of the dyer.

Woad when gathered is carried to the mill and ground. I need not describe this mill because they are to be seen in

open sheds in several parts of England, only that I conceive some improvement might be made in their construction so as not so much to press out and waste the sap which contains the very essence of the dying principle. These mills grind or cut the leaves small and then they are cast into heaps where they ferment and gain an adhesive consistence; they are there formed into balls as compact as possible and placed on hurdles lying horizontally in a shed one over the other, with room for air between, to receive from the atmospheric air a principle which is said to improve them as a dye as well as to dry them to a degree proper to be fermented, but in summer these balls are apt to crack in drying and become flyblown when thousands of a peculiar maggot generate and eat or destroy all that is useful to the dyer.—Therefore they require attention as soon as they are observed to crack to look them all over well, close them again so as to render them as compact and solid as possible, and if the maggot or worm has already generated, some fine flour lime strewed over it will destroy them and be of much service in the fermentation. These balls, if properly preserved, will be very heavy, but if worm eaten very light and of little value. They are then to be replaced on the hurdles and turned, not being suffered to touch each other, until a month or more after the whole that is intended for one fermenting couch is gathered in, ground and balled, and often until the hot weather of summer is past, to render the offensive operation of turning it less disagreeable and not so apt to overheat, and though temperature herein is necessary yet a certain degree of heat must be attained before it is in proper condition for the dyer's use. This is easily distinguished by a change of smell from that which is most putrid and offensive to one which is more agreeable and sweet (if I may be allowed the term) for few people at first can either approve of the smell of Woad or a Woad vat; though when in condition they become quite agreeable to those whose business is to attend them. Woad is in this state of

fermentation more or less time, according to the season and the degree of heat it is suffered to attain, whether at an early period or according to the opinion of those who attend the process; but the best Woad is produced from a heat temperately brought forward in the couch until at maturity, and turned (on every occasion necessary) which a proper degree of attention will soon discover.

These balls when dry are very hard and compact, and require to be broken to pieces with a mallet and put into a a heap and watered to a due degree only sufficient to promote fermentation but not by too much moisture which would retard it; and here is a crisis necessary to be attended. When the couch has attained its due point it is opened, spread and turned until regularly cooled, and then it is considered in condition for sale; but the immediate use of Woad new from the couch is not advised by dyers who are experienced, for new Woad is not so regular in its fermentation in the blue vat.

This is the common process. Woad oftentimes is spoiled herein by people who know nothing of the principles of its dye, following their accustomed process of preparing it; and hence the difference in its quality is as often seen as it is in the real richness or poverty of the leaves from the quality of the land. The process for preparing Woad and which I have followed being, in my estimation, beyond comparison best, is as follows:

Gather the leaves, put them to dry, and turn them so as not to let them heat and so be reduced to a paste; which in fine weather children can do; in wet weather my method was to convey them to my stove and when I had got a quantity sufficiently dry I proceeded to the couch and there put them in a large heap; where if not too dry they would begin to ferment soon and heat, if too wet they would rot, but not properly ferment nor readily become in a condition for the dyer. These leaves not having been ground nor placed in balls on the hurdles their fermenting quality was more

active and required more attention and also the application of lime occasionally to regulate the process with the same kind of judgment as used in the blue dying Woad vat.—When the heat increases too rapidly, turning is indispensably necessary, and the application of very fine flour lime regularly strewed over every laying of them; or if the couch is getting too dry, lime water instead of common water applied by a gardener's watering pot may have an equal effect without loading the Woad with the gross matter of the lime; though I conceive the gross dry flour lime and the oxygen in the air furnish more carbonic acid gas to the Woad, and retain such principles as are essential to a better effect.

I have experienced that that Woad which requires the most lime to preserve a temperate degree of fermentation and takes most time, is best, so that at length it comes to that heat which is indispensable to the production of good Woad.

In this couch it is always particularly necessary to secure the surface as soon as the leaves begin to be reduced to a paste by rendering it as smooth as possible and free from cracks; this prevents the escape of much carbonic acid gas (which is furnished by the lime and the fermentation) and also preserves it from the fly, maggots and worms which often are seen in those parts where the heat is not so great or the lime in sufficient quantity to destroy them; it is surprising to observe what a degree of heat they will bear. This attention to rendering the surface of the couch even and compact, is equally necessary in either process, and to turning the Woad as a dung heap exactly, digging perpendicularly to the bottom. The couching house should have an even floor of stone or brick and the walls the same, and every part of the couch of Woad should be beaten with a shovel and trodden to render it as compact as possible.

The grower of Woad should erect a long shed in the

centre of his land, facing the south, the ground lying on a descent so as to admit the sun to the back part; and here the Woad should be put down as gathered and spread thin at one end, keeping children to turn it towards the other end. In the course of a week every day's gathering will be dry for the couch which should be at the other end; therefore it will be necessary to calculate how long the shed should be; but this can be erected as you gather, and then it will soon be known. I never used the thermometer to discover or determine the heat which is necessary to produce that change of smell which finishes a couch of Woad properly for the dyer (I suppose from 100 to 120 degrees of Fahrenheit) but I am convinced that it cannot be regularly obtained but by temperance and time. Good Woad, such as the richest land produces, if properly prepared, will be of a blackish green and mouldy; and when small lumps are pulled asunder the fracture and fibres are brown; and these fibres will draw apart like small threads, and the more stringy they are and the darker the external appearance and if of a green hue, the better the Woad; but poor land produces it of a light brownish green.

The fibres only serve to shew that it has not suffered by putrefaction.

Considerable fortunes have been acquired by the culture of Woad in the north of England, and those who have not in possession land sufficient of proper staple will give an extra rent for leave to break pasturage; and such as is old and is sod worn out and full of ant hills from long feeding, is equally good when lime is applied to destroy these and other insects which here exist, more than such as is in full proof to bear grass; for here they generate and become destructive so as often to render it very necessary to plough such land, corn it and form a new turf; and though this is so often prohibited yet it is often consistent with the best principles of husbandry. Here Woad is every thing and corn after it to a certain degree, which experience will de-

termine according to the kind of land. Those who grow Woad in large quantities have moveable huts for their work people; and all their apparatus so easily put together as to be of little expense except in carriage.

A friend of mine in London took a large quantity of land whereon had been Woad just grubbed up. He planted Woad on it and engaged a person from the north to manage it; and the produce was so abundant as to afford immense profit. I believe he only woaded two years and then let it. His tenant's produce did not by any means equal his, because the land began to want change. I know not how he succeeded in corn, but I presume he did well as it is a fine preparative for it.

A PAPER

On the Importance of regulating the Inspection of Flour, &c. in the State of New-York.

Read before the Society, February 23, 1814.

BY JONAS HUMBERT.

AGRICULTURE lays that foundation which produces a great and valuable stock, affording the means of subsistence to the greatest portion of the civilized world. Manufactures which are the most useful, and branches of commerce which are most beneficial, are intimately connected with agriculture.

Under a benign providence, the cultivator becomes the happy instrument of setting on foot commerce with her ten thousand wheels, embracing and giving efficacy to a wide range of interests, as well as diffusing through society not only the necessaries of life, but also the most of its durable comforts and enjoyments.

Experience has made it evident that there ought to be established regulations in every well organized state. Staple articles, as well for domestic use as for exportation, are always to be considered as primary objects of attention. The interests of a country, or a state, materially depend upon its general regard to the good quality of its exports. It is true, that it is the peculiar province of the legislature to superintend these important concerns: yet, would it not be highly honorable to the Society for the Promotion of Arts and Agriculture, to take up a subject, and bestow some deliberation upon a staple, deeply affecting the character as well as interests of this state. Should this imperfect sketch merit the attention of the Society—if the facts are not controvertible, and the reasoning should appear fair and con-

clusive, a representation from them to the legislature, on the importance of having the standard quality of our flour raised, so as to place the New-York market on a footing equally respectable to any other state, will, without doubt, remove the evil complained of in this paper.

Without infringing on the rights of another, each state has an indisputable control over its exports. How far our laws relating to inspection, generally, or in relation to a particular article, are well executed according to the original design of those laws, may easily be known by comparing the reputation of similar articles, from other states, in foreign markets, as well as from the credit of such imported commodities, in our own ports, with the credit of such articles manufactured at home. This mode of trial is fair and totally free from the charge of partiality.

How it has happened that the flour of this market, very generally, should have been found of quite inferior quality to that of several other states, during a number of years past, is surely a subject of some moment to that respectable Society to whom I have taken the freedom of presenting this paper. This fact has become so notorious that it is absolutely incontrovertible. The "prices current" of Europe as well as those of the West-India islands, together with repeated publications in our daily papers, evidently prove that the flour of the New-York market has been sold at reduced prices, while that of Richmond, Philadelphia, and other southern places, would sell at the same ports at an advance, sometimes one and a half, and others, at two dollars per barrel. Independent of these publications, captains of vessels and persons who have witnessed the fact in the islands, have declared the same facts, with surprise and regret. Is it not at once both a reflection on the reputation as well as a most serious loss to our state, that its greatest staple should be so far undervalued, when circumstances would warrant a high character in this respect? Can any solid and permanent advantages arise from such a state of

things? Do not the dictates of common understanding reject the idea? Independent of many disadvantages under which many of our great shippers have labored for several years past, there is scarcely a farmer who has not been an actual loser from the fallen reputation of our flour. A staple which gives circulation to about five, and sometimes seven, million of dollars through our state in the course of a single year, is worthy serious notice.

Permit me to say, gentlemen, that the wheat of this state, may with great propriety be called our farmers' golden bank, ceded to them by the high chancery of Heaven, and held by a tenure as firm and irreversible as any law of nature. From the great quantity of unimproved lands in this state, our farmers, for some years yet to come, will be induced to raise grain with increased abundance. It is of great consequence then, to the agriculturalist that the reputation of our wheat should not suffer from want of suitable attention to preserve it sound and good; and that when manufactured, the flour shall not be injured; but its credit placed on an equal footing, at least, in foreign markets, as well as at home, with the flour of any state in the union.

I do not hesitate to say that the generality of our wheat is equal to any raised in our sister states. In several counties it is much finer in appearance; is richer in quality, and considerably heavier than the wheat of Virginia generally. Pennsylvania, though its flour is in much better repute than ours, does not produce a larger quantity of good wheat than our state, yet she has been our rival, her flour commanding a much higher price. Observation and the experience of many years in the use and manufacture of all kinds of flour into various qualities of bread, has confirmed me in the belief, that no grain of Virginia is equal in all respects to the grain in most of the counties in our western district, and several extensive tracts on this side of Albany: that which approximates nearest to our fine and best wheat, is what is termed their "May wheat" and some produced on the eastern shore of Maryland.

If our wheat, on an average, is as good now as it was formerly, it becomes an interesting inquiry to arrive at the true and real cause why our flour is so much inferior to a large portion manufactured in several southern states, from wheat in several particulars inferior to ours. As there is no just cause to rest a belief that our grain has depreciated, the low repute of our flour is to be found principally in the improper mode of manufacturing, pursued by too many of the millers of this state, but especially those denominated merchant millers.

A practice has obtained sanction among many extensive manufacturers residing at no great distance from this port, and improperly countenanced by several public functionaries, which goes directly to destroy the essential and most beneficial qualities of the grain. These manufacturers are notorious for grinding excessively close, and some for regrinding a large portion of the middlings so closely that it is made to pass their finest bolting cloth: this flour is mixed with the first portion that is bolted from the first grinding, and all is thrown into the packing chest and mixed together, and finally put up for superfine flour. To the eye this mass appears very fine; but when mixed with water it is very deficient in elasticity, and when worked by the hand is similar to clay mixed with water. No inspector general, possessing any tolerable knowledge of the nature and requisite properties of good flour, would have given any countenance to a practice so palpably ruinous to the article itself, and detrimental to the reputation and interests of our state.

It does not comport with the design and limits prescribed to this paper, to enter into an investigation of all the properties of the farinaceous substance under consideration.—While I am frank to acknowledge my inability to enter into a minute examination of the elementary as well as alimentary properties and qualities of wheat, I shall not hesitate to say, that the most eminent chemists of Europe, as well as distinguished professional gentlemen of our own country,

have left the subject in a state of considerable incertitude, as it regards the essential components, constituting the grain of which we are speaking. Experimental philosophy would render our state much service by an accurate and complete analysis. I hope the Society will appoint a committee of gentlemen, distinguished for skill in chemistry, who feel an interest in the pursuit of science, and who view the whole of this communication as designed to place our state on proper ground, and who shall be able by their art to demonstrate what I here venture to assert, which is—that our fine wheat possesses an enriching quality in greater abundance than any wheat of Virginia, the best not excepted.

The Society will indulge me a moment, while I offer a few remarks somewhat connected with science. I begin then by asking a simple question. What injury is done to flour when ground excessively close, or by re-grinding a part the second time? The answer to this enquiry I presume is—that the *life* of such *flour* is either materially *injured*, or totally *destroyed*. Again. But what constitutes that life, and how does excessive close grinding affect and injure such life of flour? Life, generally speaking, is an active principle. And the *life* of *flour*, I do not hesitate to say, is *fixed air*, entirely independent of the saccharine, which is its natural principle of fermentation, and when absent from fixed air hastens to acidity, and will never expand with the gluten, so as to answer any valuable purpose. It is (without question) fixed air, that is the life of flour, and not the gluten, as has been erroneously supposed by some persons.

It is well known that heat disengages air; and when the mill stones become immoderately heated, either by too great contact, or long action, or improperly crowded with grain, so in proportion, the elastic principle, power, or life, becomes expelled: in such case, the gluten, or animal substance, is not destroyed, but is incapable of expanding as it would do, owing to absence or expulsion of the air from ex-

cessive heat. The *life* of *flour* sufficient for the beneficial designs of fermentation, can only be *found* when the *grain* is properly *cut:* the more *perfectly* this is done, even in making superfine flour, the better it will be found, and the bread produced vastly preferable in several respects; to the eye it appears handsome; and in point of health, it is very advantageous.

Wheat is frequently so closely squeezed between the mill stones that it is next to an impalpable powder when bolted; it eludes the eye of him who is unacquainted with the nature of the substance he handles; it cannot make good bread for the reasons already mentioned. I should be thought calling in question the information of the Society if I were to offer any reasoning on the strength or elasticity of air.

If this paper was intended to treat on the art of making good bread, I presume it could be made evident to every mind, how exquisitely this active principle diffuses and incorporates itself with the minutest particle of flour, in fermentation, by means of the tenacity of the gluten, forming and expanding a membrane of a texture exceeding fine, not easily to be perceived by the naked eye, similar to the finest twilling in point of figure, with the utmost exactness; is beautifully transparent and perfectly seen when exposed to the light of the sun in the smallest flake torn from a loaf while warm, before the steam is evaporated, which is made of flour properly manufactured.

Nature indeed has not studied to amuse the idle fancy or vain curiosity of her sons, in the formation, or production, of the grain of wheat, but most admirably, as well as benignly consulted their health, combined with exquisite gratification. Expel partially, or extract this power altogether, and the remaining mass will be found an indigestible compound, and if mixed with water and yeast, instead of producing bread, it would hasten into a putrid body, or if baked, would be unfit for the purposes of nutriment.

No question can be entertained but that there are some other causes which have operated to the injury of our market, and proved hurtful to our flour, in respect to quality.—These particulars loudly demanded the attention of several inspectors who ought to have checked the evils a long time since.

There are some few manufacturers residing near this city, who frequently purchase old and spoiled flour to have it mixed with newly ground wheat. A moment's reflection will be sufficient to convince every person that such practice is not only unjust, but highly detrimental to those who are more conscientious in manufacturing flour, and operating altogether injuriously to our state. Such flour cannot be transported to a warm climate with safety; ten days confinement in the hold of a vessel, is sufficient to spoil the contents of every barrel so shipped. By the inattention or want of knowledge in persons who have been placed in office, the fair dealer and upright manufacturer, is placed to vast disadvantage; his flour is only designated by the New-York brand, is shipped with the former, and sold at a foreign port, all *en masse*.

Previous to the American revolution our flour carried the palm, its sweet and fine quality generally commanded a higher price, even above that of Philadelphia and Virginia: this information I have directly from a respectable gentleman, who was a witness to the fact when transacting business in the West-Indies. Some years after that memorable period our flour kept its credit. But during the great scarcity of flour in England some fourteen years past, several of the manufacturers near our city, fell upon a scheme of making more flour from a given quantity of wheat; they succeeded by close grinding and re-grinding. Every particle of the course flour and middlings was made so fine by repeated grinding, that all passed the superfine bolting cloth. A Mr. Barlow, residing near New-Rochelle, was the first miller near our city who commenced such practice, if

my memory is correct. Here lassitude, inattention, or want of knowledge in several public functionaries, afforded speculation a fair opportunity to sink the reputation of our state to an extent, not at first view easily to be imagined. From the port of New-York there has been shipped for several years past, rising of four hundred thousand barrels of flour, some times more. The largest portion of which has been manufactured in our state. Agreeably to the "prices current," and quotations in our public prints, our state has been a loser of at least half a million of dollars for several years past, in succession.

Gentlemen! can it be considered in any other light than highly disadvantageous to this state, to suffer its principal staple to remain in its present state of depression? Commerce as well as agriculture is deeply interested in the reputation of the article in question. I have purposely declined availing myself of the universal murmurs of the bakers in this city. Many of our greatest shippers have loudly complained. Several who are manufacturers, are desirous of a reform, being firmly convinced themselves, that such mal-practice is highly detrimental to the permanent interest of this state.

Before this paper is concluded, I beg leave to mention a circumstance of some moment to millers residing westward in our state. For several years past I have seen large quantities of their flour arriving in this market in a spoiled state, and sold at considerable loss. I had a fair opportunity to examine such flour when I was deputy inspector with Wm. Jones; a great deal of it was from wheat of a superior quality. It was not my province to proffer a remedy; that, I always considered to be the duty of those who were honored with the appointment time after time. Why neither have attempted to do justice to those persons, as well as to the state generally, is best known to themselves the remedy is easy and simple.

The Society, it is hoped, will feel an interest in the sub-

ject. On the ground of science it may afford inquiry and useful investigation; as it relates to the lasting advantage of our state, I hope there does not remain a single doubt; that the inspector general of flour ought to possess experience in farenacious substances, and some acquaintance with the relative qualities of wheat, of our own and the southern states, it is presumed, does not admit of a single question.

I had designed to offer some remarks on manufacturing flour, as well as on the benefit and best mode of preserving wheat, but time does not permit.

Should the doctrines and sentiments embraced in this address, meet with a favorable reception by the Society, it may embolden me to present a communication at a future day, somewhat in conformity with the subject now but imperfectly treated. Perhaps I have trespassed too long on the time and patience of the Society.

LETTER

From Professor BROWNELL *to the Hon.* ROBERT R. LIVINGSTON, *on the subject of Merino Sheep.*

Union College, Nov. 10th, 1810.

DEAR SIR,

Constant occupation has prevented me from paying earlier attention to your letter of the 24th Sept.—I am happy that you considered the specimens of English wool, and Lord Somerville's treatise on sheep, worthy of your acceptance.

Your observation is doubtless correct, "that if it be a fact that the merino wool degenerates in Britain it will become a more important object to us; not only for the supply of our own wants, but as an article of exportation."

Agreeable to your request I shall subjoin a few observations on the subject, in addition to what I have already stated.

While in London, I had the honor of being admitted to the sittings of the British Board of Agriculture, through the attention of Mr. Pinkney, who is an honorary member of it, and the politeness of Sir John Sinclair, its President. The question of the deterioration of merino wool in Britain, was much discussed by the members, with great diversity of opinion. This circumstance, together with the interest the subject would otherwise have excited, determined me to be minute in my enquiries during my subsequent tour through the kingdom. In passing through the district of country in which almost all the finest cloths are fabricated, I made particular enquiries on this subject of every manufacturer in the vicinity of my road. Their general testimony was *that merino wool degenerated in Britain, both in fineness and softness.* I regret much that I had not an opportunity of seeing Messrs. Sheppard and Lloyd of this district, who are eminent clothiers, and who are extensively engaged in

breeding merino flocks. Mr. Sheppard has written a very long, and a very judicious letter to Sir John Sinclair on the subject of his experiments: and though he is a great advocate for the propagation of the Spanish breed, and for crossing with it the native fine-wooled breeds, he explicitly acknowledges the deterioration. "I have before me," says he, "large samples of the wool of my first crosses from Lord Bathurst's ram with my Ryeland ewes, shorn in 1802, and of the wool from the same sheep, shorn in the present year (1806.) The quality of the wool in the course of that time has so much degenerated that I should conceive the lapse of a similar period would reduce it to the coarseness of the original stock." He further adds, "I have found also the wool of his Majesty's ram much degenerated, from the comparison of specimens in 1803, and the present year" (1806.) —All the manufacturing gentlemen with whom I conversed concurred in the opinion, that crossing the merino with the fine wooled breeds of England would greatly improve the fleeces of those breeds, but they also generally agreed that it was impossible to preserve the merino fleece in such perfection there, as to supercede the necessity of importations of foreign wool.

Reasoning *a priori*, we should be led to the same conclusions which these opinions seem to warrant. The extreme humidity of the climate, and the rankness and sourness of vegetation consequent upon it, might be expected to give a laxness and coarseness to the texture of the skin, and a lankness and coarseness to the fibre of the wool. If I mistake not, the effect of a damp, foggy climate upon the texture of skin is observable in that country even in the human species. Though the English are distinguished for symmetry of features, and their florid complexions, yet we rarely observe that smoothness and firmness in the tissue of the skin, resembling the polish of ivory, which is so common in this country. If this be the case with the human species, much more must it be so with the brute creation which is so constantly exposed to the effects of the climate.

That the climate of England is unfavorable to the production of fine wool, is further corroborated by the fact that the native breeds of the country are, in general, extremely coarse-wooled. There are but two distinct breeds, of any note, excepted—the Ryeland, and the South-Down breeds. The former are limited chiefly to the eastern part of Herefordshire and Dean Forest, and the latter to the downs of Dorsetshire—the dryest districts in the kingdom, and producing the sweetest food.

It is remarked by the manufacturers, that the fleece of the merino not only grows coarser by naturalization in England, but loses also much of its original softness and elasticity. This is attributed to the moisture destroying the yolk, and penetrating the fleece, by which means the knotty curls are relaxed, and the fibres become harsher, and less elastic and silky.

Whether the merino breed of sheep would depreciate in this country, is a question that deserves a full consideration. However the fact may be, the causes which I have suggested as effecting the deterioration in England do not exist in the United States. Our climate is dry, our lands hilly—at least in those parts of the Union which are most stocked with sheep—our feed is short, fine, and savory. There is hardly any animal that is more attached to sweet and high-flavored food than the sheep. Few climates are more favorable to such a vegetation than ours:—few more unfavorable than that of England. The atmosphere of that country, during the greater portion of the year, is damp and chilling; and even in the clearest days it is loaded with a congregation of vapors in a state of half dissolution, which refract and dissipate the rays of the sun, and obstruct their genial warmth. We never perceive there, those bright and piercing beams of light and heat, those bright and glowing tints of the heavens, and that bright and clear azure of the sky which we are so much accustomed to in this country. The grapes, plants and trees—the whole vegetable kingdom wears there a tenderer, paler green; and nature seems to

have softened all her glaring colours, by wrapping about herself a semi-pellucid veil of mist.

Your experiments, and those of Col. Humphreys I believe, concur in proving that the merinoes have not degenerated during the short time that they have been domesticated in this country. It is also certain that for a long period of years, they have not degenerated in climates similar to ours. They were introduced into Saxony as early as the year 1713. "The best wools from that country," says Mr. Sheppard, "equal in smallness of fibre, and exceed in softness of feel, the finest wools of Spain, and are eagerly purchased, at even higher prices, by the manufacturers in this country," (England.)—This opinion was confirmed to me by every manufacturer with whom I conversed.

In your excellent essay on sheep, you have shewn that the Spanish breed has rather improved than deteriorated in France; and it is said that their wool retains all its native fineness even in the cold climate of Sweden. There seems to me no good reason why they should not succeed as well here, as in Spain, France or Saxony.

I have already extended this letter to such length that it would become tedious were I to endeavor to point out all the advantages that would result to our farmers from extending the breed of these useful animals. There can be no doubt that with the aid of labor-saving machinery in the picking, carding and spinning of wool, and in the shearing and dressing of cloth, we might afford to make many of our woollen fabrics cheaper than we can import them. Neither have I any doubt that with proper attention to the propagation of the breed through the eastern and middle states, our fine wool would in a few years rival any other single article of exportation.

With great respect,

Your obedient servant,

T. C. BROWNELL.

Hon. Chancellor Livingston.

Researches on the light manifested in the combustion of inflammable substances, by COUNT RUMFORD, *F. R. S. and Foreign Associate of the National Institute; read at the sitting of the first class of the Institute, October* 14, 1811. *Translated by* JAMES LOW, *M. D. and Secretary to the Society of Arts.*

WHEN an inflammable substance, in a state of purity, such for example as wax, fat, or purified oils, is burnt entirely, or without leaving any residuum, and with a transparent, lively, white flame, and without smoke or odour, its combustion is regarded as complete, and its products (water in the state of vapour, and carbonic acid gas) are always identical, and in the same proportions for each substance.

Those who consider light as a particular substance emanated from luminous bodies, have been obliged to seek the source of that which is manifested in combustion, among the different substances which unite in this process. Some suppose that the inflammable substance furnishes it, others that it proceeds from the air which supports the combustion; and some have imagined that it is furnished partly by the air, and partly by the inflammable substance which is burnt.

If this light was in reality one of the chemical products of combustion, as has been supposed, we ought, without doubt, to find it *pre-existing* in these bodies, and we are authorized by every analogy, to conclude, that in this case, the quantity of light developed in the perfect combustion of a given quantity of any inflammable substance, ought necessarily to be limited, and as uniform as the other chemical products of the process.

But if light is not a substance emanated from luminous bodies, but a vibration and undulation in ether, analagous to the undulation in air, which is the immediate cause of sound, as a great number of distinguished philosophers have thought; in this case, we ought to seek the cause of the light diffused in a flame, in the very high temperature of the different particles of matter which compose this flame; these particles would be luminous in the same manner as red hot iron is luminous, and would disappear at the instant when they became so cold, that their light (or the vibrations which they excite in ether) should cease to be visible.

In adopting this hypothesis, we must not expect to find the quantities of light bearing a constant proportion to the quantities of inflammable matter burnt; much less ought we to expect the existence of such a proportion, as a demonstrative proof of the falsity of the hypothesis, for this reason —The volume and form of a flame ought necessarily to have a great influence on the celerity of its cooling; and if it shall be found that these circumstances have no influence on the quantity of light which is diffused, it will be sufficiently proved, that this light does not depend on the preservation of the heat of the particles which compose this flame.

But, if it shall be found by the result of decisive experiments, that the light diffused in the perfect combustion of the same quantity of inflammable matter is variable; it will be impossible, it appears to me, not to perceive that this light cannot be a chemical product of combustion, and that the hypothesis which supposes light a substance emanated from luminous bodies, would become more and more difficult to maintain.

If this was the agitation of a question merely speculative, and which in its nature could have no real influence either on the progress of the sciences, or on the useful arts which depend on them, I should be the first to condemn its discussion, not only on account of its inutility, but also, and par-

ticularly, on account of the disagreeable consequences to society, which always result from tedious and endless disputes.

To perceive all the importance of the question we have agitated, we have only to consider the great advantage to the public, which cannot fail to result from the discovery of a fixed principle, which may be employed with facility and success, to perfect the art of *illumination*, and the instruments employed in it.

What enormous sums are annually and daily expended to dissipate the darkness of night! and, moreover, in what a deplorable state do we find the science which ought to illustrate all the details of this important operation!

How shall we attempt to perfect the art of *illumination* while we continue so ignorant of the nature of light, that we know not, even where to search for it?

Having considered this interesting subject for a long time, I have made a number of experiments which appear to me calculated to throw light on it. I am about to submit them to the class, but it will be necessary to commence by premising a few words on a small change which I made on an apparatus already known, and of which I availed myself in measuring the intensity of light.

Instead of employing the rules divided into inches and tenths of inches, to measure the distances of lights on the photometer, I used rules divided into degrees, which indicated directly, and without any calculation, the relative intensities of the two lights which are compared together.

These two rules, which are each twelve feet long, are divided in a similar manner. The first division of this kind of *scale of light*, which is on one of the extremities of the rules, is marked 10 degrees, and corresponds to ten inches of the middle of the vertical bottom of the photometer, when the rule is adjusted. The division which is marked 100 degrees, is at the distance of 21.62 inches from the first, (that of 10°) or at 31.62 inches from the centre of the pho-

tometer, and all the other divisions are arranged in such a manner, that the numbers which they bear, are every where proportional to the squares of the distances of the places where these divisions are marked, from the middle to the bottom of the photometer, where the two shades which are compared coincide in the experiments.

To complete the important part of a standard of light, it is necessary to have a very steady light, and, at the same time, one known to every one. I found these two qualities in a good candle. That which I chose, was of those which are five to a pound; it was 9 lines in diameter, 10 inches and a quarter long, and weighed 90 grammes, (about 3 ounces); it burnt 7 grammes of wax per hour, with a beautiful flame, and with an uniformity so perfect, that it rarely varied a fortieth in its ordinary consumption.

I have given to the light of this candle the value of 100 degrees, and I placed the candle always at the division of the scale of the photometer, which is marked 100 degrees, when it is burning. In order to express in a uniform and convenient manner the quantities of the different inflammable substances consumed in the experiments, I divided into 100 parts the quantity of wax which the candle I used as a standard consumed in an hour (=7 grammes), and I established one of these parts (= $\frac{7}{100}$ de grammes or 1.34545 grains) as an unit of weight (unite de poids), and I employ it as such in all my experiments.

We shall see in the sequel, how this arrangement has rendered the comparison of the result of my experiments easy and intelligible.

The objects I had particularly in view in the course of experiments, of which I now have the honor of giving an account to the class, was to determine if the quantity of light manifested during the combustion of an inflammable substance, is always in an invariable proportion to the quantity of the substance which is consumed; and as the flame of an Argand's lamp has a double current of air, well regulat-

ed, and is very beautiful; and as the purified oil, employed in these lamps in Paris, burns without smoke or odour, and without residuum, I endeavored, moreover, to discover whether this lamp always gave a quantity of light which was in an invariable proportion to the oil burnt. The following are the experiments and their results.

Exp. 1.—An excellent lamp, which had been carefully cleaned, adjusted, and weighed, was lighted and placed before the photometer, where it was regulated, for 30 minutes, in such a manner as to afford constantly 100° of light; the same quantity which the candle had furnished.

At the end of this experiment, the lamp was extinguished, and on weighing it anew, I found there had been 8 grammes of oil consumed.

This quantity is =114 parts, consequently the consumption of the lamp was in the proportion of 228 parts of oil per hour, for 100° of light; or for 100 parts of oil, it had yielded 48° of light.

The candle consumed 100 parts of wax, and gave 100° of light.

Exp. 2.—The lamp having been cleaned, adjusted, and weighed again, was placed before the photometer, directly opposite the division of its scale marked 200°, when, after having been lighted, it was regulated in such a manner, for 30 minutes, as to give uniformly 200° of light.

In this experiment, 10.3 grammes of oil were consumed. That is, in the ratio of 271 parts of oil per hour, for 200° of light, or for 100 parts of oil, 74° of light.

Exp. 3.—The lamp having been cleaned and adjusted as before, was placed for the third time before the photometer. In this experiment, it gave during 30 minutes, 300° of light, and consumed 10.7 grammes of oil.

That is, in the ratio of 305 parts of oil per hour, for 300°; or for 100 parts of oil, 98° of light.

Exp. 4.—The lamp having been carefully prepared and, placed before the photometer, was managed for thirty mi-

nutes in such a manner as to give constantly 400° of light, and it burnt 12.7 grammes of oil; that is, in the ratio of 361 parts of oil per hour, for 400° of light; or for 100 parts of oil, 112° of light.

This is the first experiment where a given quantity of oil has furnished more light than an equal given quantity of wax; but without stopping to make any observations on this fact, I pass on to more important results; and to save time, I shall exhibit in a tabular form, the results of the four experiments, of which I have given some account, and shall add to them the results of five others, which, as well as the four preceding, were all made the same day, with the same lamp, the same candle, and the same care.

Order of Experiments.	Intensity of the light furnished by the lamp during 30 minutes.	Quantity of oil consumed per hour.	Light furnished per hour, from the consumption of 100 parts of oil.
1	100°	228 parts	48°
2	200	271	74
3	300	305	93
4	400	361	112
5	500	405	121
6	600	441	138
7	700	470	149
8	800	515	155
9	900	560	160

On comparing the results of these nine experiments, we find that the quantities of light furnished, were far from being in a constant proportion to the quantities of oil consumed, as should have been the case, if light was one of the chemical products of combustion. The quantity of light afforded by 100 parts of oil, was almost four times as much in the ninth experiment as in the first, though the flame was equally clear in both, as indeed it was in all the other experiments, and had neither manifested smoke or odour.

As it appeared very probable to me, that a small flame of a particular form, always yielded less light in proportion

to the oil consumed, than a larger one of the same form; to illucidate this fact, I made the four following experiments:

I had a small portable lamp made, with a wick composed of four flat wicks, touching each other in the centre of a circle, in such a manner, as that a horizontal section of this compound wick, formed a cross at right angles. Each of these four flat wicks was three lines broad; and in adjusting the lamp for the first experiment, I cut each of these flat wicks in a slope, of such a degree as to leave the centre about a line higher than the circumference, and the four wicks only touched each other in the centre.

These wicks being cut in this manner, it was easy to cause the lamp to burn with a very small flame, which was necessary to answer my intentions.

I made four experiments with this lamp, and with the following results:

Order of Experiments.	Intensity of the light furnished by the lamp.	Quantity of oil consumed per hour.	Light furnished per hour, from the consumption of 100 parts of oil.
10	25°	67	37°
11	100	143	70
12	225	211	112
13	255	214	118

In the thirteenth experiment there was three times more light from a given quantity of oil than in the tenth.

I made many other experiments, similar to these, with other lamps, and always with results analogous to those which we have seen; but without stopping I pass on to other experiments made with candles, which have afforded the most interesting result.

Exp. 14.—To determine whether the delicate flame of a small candle gave less light than the flame of an ordinary candle, in proportion to the wax which it consumed, I made the following experiment:

A small candle of the kind used in dark lanthorns, four lines and a half in diameter, was placed before the photo-

meter, when it burnt sixty minutes, giving constantly 94° of light.

During this experiment, it consumed 2.7 grammes of wax, that is, 77 parts of wax per hour, for 64° of light. Whereas, from 100 parts of wax, we should only have had 83° of light instead of 100°, which an ordinary candle gives from the same consumption of wax.

Exp. 15.—A small watch lamp, seven lines in diameter, and two inches long, and which weighed 11.15 grammes, was placed standing and floating in a small vessel, in the manner that this kind of watch lamp is always arranged. After having burnt tranquilly for two hours and forty minutes, it was extinguished, wiped, and then weighed anew.

It was found that it had consumed 4.75 grammes of wax, which gave 1.7812 grammes,=25 parts of wax, for the consumption of this small taper per hour.

If it had yielded as much light in proportion to this consumption as an ordinary candle, we should have found its light =25°.

Having measured its light by means of the photometer, I found it=1.52°, or a little more than a degree and a half, instead of being 25°.

Here then was a flame, and even the flame of a candle, which was sixteen times more faint than it ought to have been from the quantity of wax which disappeared.

Notwithstanding the results of the preceding experiments and the reflections to which they gave rise, had prepared me to find the light of this small watch lamp very feeble, I was greatly surprised at finding it so extremely faint. I immediately repeated the experiment several times, and with the greatest care, and notwithstanding the little candle gave sometimes for an instant a little more light, it as often gave only half the quantity above stated, and I am persuaded that in estimating its light at a degree and a half, we give it its maximum.

This result can be satisfactorily explained, admitting the

hypothesis which regards light as being analogous to sound. The flame of the watch lamp was very small, the particles which composed it were cooled so rapidly, that they had scarcely time to shine an instant, before they disappeared entirely.

It would have been extremely natural to have attributed the faintness of the light in this experiment to the feebleness of the combustion, if the quantity of wax consumed had not afforded a demonstrative proof that the combustion was not in the least faint.

But here a very interesting question presents itself: if it has been proved to a certainty, from the quantity of wax burnt, that the process of cumbustion took place with its ordinary vivacity, what became of the heat which ought to have been developed in the operation?

I have sought it, and have had the satisfaction not only to discover it, but to discover it entirely.

I found that the small candle never ceased to furnish it for an instant during the whole course of the experiment.

A moment's reflection made it obvious that the heat which the particles composing the small flame parted with so rapidly, could not be lost entirely, and that it would be found in the current of warm air which rose above the flame.

Holding my hand open at the distance of two or three inches above the faint flame of the little candle, I found in reality a degree of heat that astonished me, and was altogether insupportable, so that I was obliged to withdraw my hand suddenly.

I believe that a burn never gave any person so much pleasure as that did me.

I lost no time in prosecuting an experiment which should clear up this mystery in such a manner as not to leave any doubt.

Exp. 16.—I had fortunately in my laboratory an apparatus ready prepared, (I had used it in other experiments) which was well calculated for the experiment I was desirous

of making. This apparatus consisted of a small cauldron of tinned iron, well polished on the outside, and of a conical form, with a circular bottom, seven inches and ten lines in diameter, and a little swelled inwardly. This cauldron was four and a half inches deep, and six inches wide at the top, and tapered off above like a wine bottle, having a long neck, in which was placed a mercurial thermometer, which served to indicate the temperature of the liquid which the cauldron contained. I placed this little cauldron upon a small board, an inch thick, which had a hole in its centre, about three inches in diameter. This board was attached to an upright post, in such a manner that it could be fixed at any desirable height; the lamp was placed below it on a table.

Having put into this small cauldron 2000 grammes of water, at the temperature of 64° Fahrenheit (which was also the temperature of the room in which the experiment was made) a small candle of a known weight placed in its vessel, and floating on the water where it was placed, was lighted, and put afterwards under the cauldron, at such a distance that the point of the small flame reached on a line with the inferior surface of the board on which the cauldron was placed, and below the centre of the hole made in the board, to give passage to the flame.

The following is the result of this experiment: The small candle having burnt under the cauldron for fifty-two minutes and fifteen seconds, the thermometer indicated the water to have acquired the temperature of 75° Fahrenheit, the candle was extinguished, and having been wiped and weighed, it was found to have lost during this experiment 1.55 grammes of wax.

Exp. 17.—The cauldron having been emptied and cooled, was filled again with 2000 grammes of water, at the temperature of 65° Fahrenheit, and placed on the board.

A good candle of the ordinary size, weighing three ounces, properly placed under the cauldron, was lighted.

It had burnt tranquilly and equally for twelve minutes and thirty seconds, when the thermometer placed in the cauldron showed that the water had acquired the temperature of 75° Fahrenheit. I immediately extinguished the candle, and on weighing it anew, I found that it had consumed 1.62 grammes of wax during the experiment.

The difference between the quantities of wax burnt in these two experiments, in giving the same quantity of heat to the same quantity of water, is very small (=0.07 of a gramme) and it can be readily explained, in a satisfactory manner, without having recourse to the supposition (otherwise very improbable) that the temperature at which the decomposition of an inflammable substance takes place in combustion, is perhaps variable.

The light which is manifested in this process is to a certainty variable, and to a surprising degree.

The results of the experiments which we have related are very interesting, and the more we examine them, the more important do the facts which they present to us appear.

They teach us more fully to comprehend *light* and *heat*, and to distinguish and appreciate their effects.

There will be less difficulty in conceiving the existence of a true combustion, accompanied by its peculiar temperature, in all the cases, when the products of a chemical operation indicate it, even though the light which accompanies it should not be visible, and though the heat *found* which results from it, should not evince directly, the existence of so high a temperature.

There will also be less difficulty in admitting that all chemical operations have always a regard to fixed and invariable temperatures in all cases.

Since we have regarded light as a peculiar substance, we have naturally endeavored to comprehend its combinations with other substances, and the laws of its affinities; and without permitting ourselves in the least to doubt the reality of its existence as a substance, we have become so

familiarized with the idea of its accumulation, condensation, fixation, liberation, &c. that in the end this doctrine appears to contain nothing but what is simple and easy of comprehension.

If the light which shines on us was in reality a substance which luminous bodies sent to us, we might hope to be able to discover how and where it existed before it was transmitted to us; but if it is only an impulse (coup) given to the eye, by the repercussion of an elastic fluid which touches the eye, and at the same time all the bodies in the universe, we should lose time either in seeking its *source* or its chemical properties.

No person I think ever advised us to search for sound in *fulminating powder;* is it more reasonable to seek in the substance which is burnt for the light which it emits?

The light which stares us in the face only exists in the eye.

The eye is formed in such a manner as only to be sensible to impressions of a limited force, and to vibrations of a certain velocity; all others are without effect on this organ.

When a common ball is heated red hot and set in a dark place to cool, it ceases to be visible to the human eye as soon as it is cooled down to the 900° of Fahrenheit's thermometer; but can it be believed that the ball experiences a sudden and notable change in its state at the instant it becomes invisible? This supposition is unreasonable.

An inhabitant of another planet, that for example discovered by Herschell, if he had eyes differently constructed from ours, and more sensible to a small degree of light, looking with the man of this globe at the ball as it was cooling, would be greatly astonished to hear him say, suddenly, "the ball has ceased to be luminous."

It is possible, and even probable, that there are animals on our own globe who perceive bodies shine after they cease to be luminous to us, and perhaps some that we are never able to see.

But if we are in a state to perceive only a part, an *unknown fraction* of that light, which luminous bodies shed, how can it be conceived that we can in any case measure it completely, and compare it with heat or any other thing?

All that we can do is, to compare the intensity of one light visible to us, with the intensity of another equally visible, in order to determine their relative power, to illuminate the objects around us; and what interests us particularly in this research, is doubtless to discover the means of arranging matters in such a manner, that the substances which afford light in their combustion shall furnish that which is useful to us in the greatest possible abundance.

It is in the application of our discoveries to perfect the art of illumination, that their importance will appear with the greatest eclat.

We have sought a long time the means of increasing the light of lamps in order to render them serviceable in light-houses, on coasts, harbors, and for other purposes, but without success. We have used lamps with a double current of air, of large dimensions, but we find that they gave less light than the same kind of lamps of the ordinary dimensions.

I believe I was the first who united together a number of lamp sockets with a double current of air in the centre of large balloons of gauze (de grands balons de gaze) for the purpose of illuminating large apartments. This invention has been found useful; but if I am not mistaken it will soon give place to one much more simple, economical, and which ought to produce a more beautiful effect.

Since I have better understood the nature of light, I have discovered the means of increasing its intensity in a focus almost at pleasure. I have just finished a lamp of a construction extremely simple, which, with four flat wicks, placed one by the side of the other at the distance of about two lines, separated in the wick-holes, to give passage to the air, affords *six times more light* than an ordinary lamp with

a double current of air, or an Argand's lamp. I have often measured the intensity of its light, by means of my photometer, and have found it from 3800° to 4000°; therefore it equalled the light of 38 or 40 good candles, burning all together, and with their greatest brilliancy.

M. Professor Pictet, inspector general of the imperial university, and M. Micheli, of Geneva, assisted in an experiment made at my house, at Antenil, some days ago, when this lamp afforded us more than 3800° of light. And M. Guy Lussac, member of the institute, was present at another experiment which gave 4000° of light. On this last occasion we compared the flame of this new lamp with that of an Argand's lamp, in order to see which was the most beautiful. The two lamps having been placed near each other, we were struck with the result of the comparison. The flame of the Argand lamp appeared as yellow and dull at the side of the new lamp, as that of a candle by the side of an Argand lamp.

The most important circumstance in this invention is, that we can give to these new polyflame lamps any degree or power of illumination we wish, and can be certain of having more light from a given quantity of oil, than from any lamp hitherto known.

The fundamental principle on which this lamp is constructed is so obvious, that it requires only to be mentioned to understand how to put it in practice in every instance.

We have only to preserve the heat of the flame as much or as long as possible. How is it obvious that a very simple contrivance will accomplish this? It is by placing a number of flat wicks close to each other (large or small), in order that, uniting together, they may cover each other, and mutually defend themselves from the surrounding cold bodies.

A flame being perfectly permeable to another flame which crosses it, as I have shown already, there is no danger that a flame in covering another, will diminish the brilliancy of the light which it sheds. I have made the light of a flame

pass through eight other flames, without its intensity or its power of illumination being sensibly diminished.

I ought to mention that my new lamp has no need of the narrow chimney or glass tube to quicken or brighten its four flames. It will be sufficient to place over it a large glass muffle, five or six inches in diameter, or more, and seven or eight inches high. This muffle is placed on a sheet of tin, which has a hole in the centre to admit the air, which should always come from below, to support the combustion of the oil.

I propose to publish a detailed description of this lamp as soon as I have brought it to perfection: in the mean time I have given a precise idea of the principles on which it is constructed, for the information of those who are disposed to assist me in completing it.

OBSERVATIONS

On the means of perfecting Lamps, with a Description of a new portable one.

BY COUNT RUMFORD, F. R. S.

And Foreign Associate of the National Institute.

Read at the sitting of the First Class of the Institute, June 24th, 1811.

Translated from the French, and read before the Society for the Promotion of Useful Arts, March 25th, 1812.

BY T. ROMEYN BECK, M. D. &c.

IT is now a long time since the subject of *Light* has occupied my attention, and particularly its production during the combustion of the various inflammable substances which are used to enlighten our dwellings. As a subject of research, it presents phænomena extremely curious, but in order to appreciate its value, it is necessary to recur to its utility. The advantages which would result from an improvement in the mode of lighting houses, are incalculable, provided it were sufficiently simple to be generally introduced. Impressed with the importance of this object, it has often been the subject of my reflections.

The result of my researches "into the quantities of light produced by wax, tallow, and the different oils," are already known, having been published in the Philosophical Transactions for 1793, but since that period, I have instituted a number of new experiments, particularly with a view to the perfecting of lamps.

Having ascertained that light of a most beautiful quality could be produced by a good lamp, for less than one eighth

of the price which the same quantity, if furnished by candles, would cost, I next endeavored to discover the defects of lamps, together with the means of removing these, and afterwards sought to render them, by the elegance of their forms and richness of their ornaments, a proper substitute for the most elegant chandeliers in our halls. The result of these researches was a hanging lamp with a circular reservoir, which I had the honor to present to the class five years since.

This lamp, which at present may be found in many of the most elegant mansions in Paris, is composed of a collection of sockets, or wick pipes, *(porte-meché)* from three to six in number, with a double current of air. These are united in the centre of a twelve sided screen, each of whose sides is from fifteen to eighteen inches in diameter. This screen is covered with gauze or white crape, encircled horizontally with a band of gilded copper, of an inch in breadth, and suspended by means of six chains, attached to six arrows of gilded copper. The latter are fastened horizontally to the band by a screw.

The screen, enclosing the lamp, so as to hide it completely from the view, is capable of being variously ornamented. M. Parquet, an ingenious manufacturer of tin lamps, residing in Paris*, who first made this lamp, (and who has sold a large number) conceived the idea of adorning it in a very rich and elegant manner. He enveloped its twelve sides, which are of brass wire and covered with white silk, with small Bohemian crystals, and formed the chains, by which it is suspended, of links of large oblong crystals, cut in facets and enchased alternately on the links of gilded copper. When finished in this manner, the lamp becomes a brilliant as well as elegant ornament to an apartment. Those who desire more richness and magnificence, may place the screen, thus adorned, in the centre of a large lustre of Bohemian glass, they may indeed cover the whole screen with

* Rue St. 'Honore, opposite that of the Lyceum.

crystals, instead of its sides merely. This has a very beautiful effect at night.

If the lamp is intended to light a dining hall or billiard room, it will be necessary to omit the lower half of the screen and substitute gauze or white crape, with a band five or six inches broad, and of the same diameter as the band of gilded copper which supports the lamp. This band of crape may be ornamented externally with Bohemian crystals, in festoons or pendants, suspended from the lower surface of the copper band.

A lamp with three wicks is perfectly sufficient to light a dining room, twenty-four feet in length and twenty in breadth, but in order to light a billiard room, one with four wicks will be required, and it is also necessary that it should be suspended at a convenient height over the middle of the billiard table. No inconvenience can result from this, since the lamp does not spill a single drop of oil. In this manner many billiard rooms in Paris are at present lighted.

The reason of the superiority of this mode over the one formerly in use may be easily explained. When a billiard room is lighted by a number of lamps, placed in different parts, every ball reflects the light of three or four at once and presents to the eye as many luminous points on its surface, together with the same number of shades, intermixed. This renders the object very confused and indistinct. But when all the *flames* are united, the source of the light which illuminates the room and the objects contained in it, is *unique*, and every ball presents to the eye a single luminous point, and a single shade, both well marked, and seen distinctly and with ease. To this may be added, that when a hall is lighted with several lamps, distributed in various parts, the eye is constantly fatigued by the dazzling glare of one or other of them; but with a lamp enclosed in a large screen, or half-screen and band, the flame is never disagreeable to the eye.

There is another kind of lamp, with a single wick, con-

tained in a circular reservoir, which has a very fine effect as a table lamp. It is placed on a supporter of from eighteen to twenty inches in height, and when covered with its half-screen of crape, it diffuses a mild light sufficient for a circular dining table of eight or ten covers. So also for a work table or reading desk, it burns agreeably and for eight hours without requiring to be touched. This lamp, which is before the class, is of an elegant form and perfect proportion, and may be attended with but little trouble.*

For a long time, I was of the opinion that we should never be able to find a lamp which would advantageously supply the place of candles, in the interior of an apartment, but since I possess this, I have given up the use of candles, and several individuals of good taste, and too much at their ease, as it respects fortune, to permit the difference of price to influence them, have, like me, preferred this lamp to candles, for common use.

This lamp, together with the hanging ones, have been for sale for a short period only, but as all artists have a right to make and vend them, I hope they may be generally diffused. They have been minutely described in a memoir read at the sitting of the first class of the institute on the 24th of March, 1806, and published with those of the class for the first half year of 1807.

Since that period, all the leisure which I have been enabled to devote to these researches, has been employed to invent and perfect a *portable lamp*, intended to supply the place not only of wax candles in antichambers, but of candles every where; and after a series of attempts and experiments, which have conducted me step by step to my object, I have succeeded in constructing one which has answered my views, and which I have the honor this day to place before the class.

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* This lamp with two half-screens of gauze or crape of different thickness, and a shade, well varnished and richly gilded, costs 55 francs. It is for sale at M. Parquet's.

This small lamp, which is of a sufficiently elegant form and very simple construction, unites many advantages which the class may appreciate. It is, in the first place, easily put in order, and diffuses a very pure and mild light, without producing the least smoke or any smell. It is constructed in so perfect a manner, that it is impossible to spill a single drop of oil, in carrying it about, and its flame confined in its small tube *(cheminée)* of glass, burns tranquilly, without being affected either by the motion of walking, or by the wind. It possesses another property which is peculiar, and which must doubtless be thought valuable, that of giving the precise quantity of light which may be required, from that of the small watch light of the bed-chamber, to the greatest degree that it can furnish and all this without any more odour when reduced to a very small flame, than when it burns with the greatest brilliancy.

It will be seen by the detailed description of this lamp, what were the means used to furnish it with the various important properties which it possesses.

The lamp is on a supporter seven or eight inches high, which is placed on a circular base and at its superior extremity is a reservoir of oil, in the shape of a mushroom, from which there passes out horizontally a handle by means of which the lamp may be carried. The wick pipe, which is a simple tube of tin, from four to five lines in diameter, is placed on the axis of the supporter and the wick is raised or lowered by means of a racket which is completely concealed within it. A lamp glass, placed in the aperture of the supporter above, serves to direct the air in such a manner as to nourish and whiten the flame and to defend it from the wind. This is a general description of the lamp; it remains to give a clear and precise account of its various parts.

The *supporter*, which is sixteen lines in diameter, is composed of two pieces of tin, in the form of tubes; these are inserted tightly into one another, and are united togeth-

er in a manner that may be stiled, *a la bayonnete.* The lower part, which ought to be at least 4½ inches in height, is fixed immoveably to the centre of the circular base of the lamp. At the upper part, is the principal reservoir which is circular, in the form of a hollow ring, and surrounding and embracing the supporter. As this hollow ring which serves as a reservoir, embraces the supporter, it is necessarily of the same diameter, both its top and bottom, its height (which forms the depth of the reservoir) is nine lines and its greatest exterior diameter, which is below, is three inches and eight lines. The opening of the wick-pipe at its superior extremity is three lines higher than the level of the upper part of the reservoir.

The exterior surface of this hollow ring is rounded in such a manner, as to give it, when viewed sideways, the appearance of a half globe flattened.

It is from the external partition of this ring, where it is rounded, that the *handle* proceeds horizontally. This very essential part, which is hollow, is made of tin, and serves not only as a handle, but also as a second reservoir for containing the oil. It is from four to five inches long, about fifteen lines broad, and nine lines thick. It is varnished black, to give it the appearance of a handle of ebony. The upper part which is flat, proceeds horizontally to join the top of the supporter and covers a part of the circular reservoir. In this flat part, above the part of the reservoir thus covered, there is a circular opening, eight lines in diameter, through which the reservoirs are filled with oil, and which is closed by a button of copper.

The oil enters directly into the circular reservoir and from thence passes into the handle by means of a horizontal pipe (three lines in diameter) through a vertical partition which divides the cavity of the handle from that of the circular reservoir. This pipe which is open and is about three or four inches long, is fastened by one of its extremities into the partition, very near the bottom of the reservoir, and

extends through the whole length of the handle, being concealed in its bottom, to the distance of three or four lines from its extremity, where it terminates. Another pipe similar to this and open at both its extremities, is inserted higher up in the same partition and entering horizontally into the handle, is attached to its top.

The only caution necessary in filling the reservoirs, is this, to pour the oil slowly, so as to give the handle time to fill by its lower horizontal pipe, whilst the air may escape without obstacle by the one above. This precaution is indispensable, for if in pouring in the oil rapidly, the circular reservoir should be suddenly filled, and the openings of the two pipes, enclosed in the handle, inundated, the air would be prevented from passing out at the cavity of the handle, through the superior pipe, and of course hinder the oil from passing freely by the lower one.

When the two reservoirs are filled, the hole through which the oil is poured, is closed hermetically with its stopper. The oil passes from the circular reservoir to the wick pipe by a tube two lines in diameter, which descending obliquely to the flat bottom of the reservoir, passes across the partition of the supporter and goes to join the wick pipe, at the distance of about two inches below its upper extremity. The oil enters into the wick pipe through a very small aperture, on the side opposite to that on which the handle is, and the small tube which carries it serves, along with another, not perforated, to fix the wick pipe in its place on the axis of the upper part of the supporter.

In order to hide the small tube which carries the oil, and to give at the same time a handsome form to the lamp, that portion of the supporter which is immediately above the level of the bottom of the circular reservoir, is covered with a trumpet formed tube, two inches in length, three inches and six lines in diameter at the top, where it is soldered to the bottom of the circular reservoir, and sixteen lines in diameter at the bottom, where it is united to the supporter, and with which it appears to form one piece.

About two lines beneath the inferior extremity of this trumpet-formed tube, the supporter is bored with a row of oblong holes, which give passage to the air that nourishes the flame of the lamp, and it is through one of these holes, that the button which moves the racket, passes, and by means of which, the wick is raised or depressed.

It will be seen from the description hereafter to be given of the reservoir, that as long as the lamp stands steady and perpendicular on its base, the oil in the handle will flow freely towards the wick pipe; but that as soon as it is moved, if the extremity of the handle happens to be higher than the opening of the wick pipe, the oil in the handle will descend to the side which is lowest. Thus instead of emptying itself through the opening into the wick pipe, it will be intercepted by the partition, separating the reservoir, and remain retained in the handle. It is evident that the oil in this case cannot flow through the pipe concealed in the bottom of the handle, since its aperture will be found above the surface of it.

To prevent the height of the oil in the wick-pipe from being affected by the motion given to the lamp in carrying it, it is made to pass into the wick pipe through a very small hole, about the fourth of a line in diameter, at its passage. This small opening ought to be in the partition of the wick pipe, and not in the bottom of the circular reservoir, thus preventing its being exposed to stoppage from the bubbles of air which might adhere to it.

There is another accident to be apprehended, and against which it is proper to be guarded. In order to supply the lamp reservoirs with air, and to facilitate the flow of oil into the wick pipe, it is necessary to leave an opening through which the air may pass. The most convenient situation for this aperture, is in the middle of the stopper to the passage by which the lamp is supplied with oil, and here I have placed it. I bored a hole in the centre, about a line in diameter, and placed in it a small vertical pipe of the

same diameter, and an inch high; but I soon found that the warmth communicated to the air by the hand when holding the lamp by its handle, frequently encreased the elasticity of the air to such a degree, as frequently to propel part of it through the hole, and in passing out, it almost invariably pushed before it a certain quantity of oil which proceeding through the vertical pipe in the stopper spread itself over the handle. To remedy this defect, which alone is sufficient to render the lamp useless, I have employed a method which has been completely successful.

Having removed the small vertical pipe on the stopper, I substituted in its place, a small case of tin, eight lines broad below, and one inch high, soldered at its base to the upper surface of the stopper, and having at its top a small hole, about half a line in diameter. The oil being propelled by the air, through the centre of the stopper into the cavity of the cone, is enabled to diffuse itself and permits the air to escape at the same time, and afterwards returns drop by drop into the reservoir.

To guard still more cautiously against any accident of this kind, I have placed on the top of the small conical cavity, a vertical pipe two lines in diameter and four or five lines in length. This hinders the oil driven by accident into the conical chamber, from proceeding during its agitation to the upper aperture through which the air passes out; thus preventing the air in any case whatever when issuing out of the lamp, from propelling the oil before it.

Experience informed me, that all these precautions were necessary to remedy so embarrassing a defect. Another imperfection common to all kinds of lamps, that of diffusing an unpleasant odour whenever they burn with a small flame, has given me no less trouble, but I believe I have discovered a very simple remedy. To judge correctly on its efficacy, it is necessary to examine the cause and nature of the evil it is intended to remove.

We all know that a lamp, with a double current of air,

burning with the brilliancy of its most vivid light, does not diffuse any smell, but if in lowering the wick, it is made to burn with a small flame, a strong and disagreeable odour will issue from it

The cause of this phœnomena, may be explained in the following manner. As long as the lamp burns lively, the current of air in its glass tube is so powerful, as not only to cool the wick hole, but also to drive the flame upwards and where it is held at a sensible distance, often more than a line above the wick hole. The latter is of course so little heated, that it does not decompose the oil in contact with it, but if in lowering the wick, the current of air becomes weak and the flame is no longer propelled upwards, it will descend gradually and finally rest on the border of the wick hole. This cannot happen without heating it to a high degree, and as it is continually moistened with oil, its decomposition explains the cause of the unpleasant odour.

This defect must necessarily occur in all lamps with a metallic wick hole, and we actually know that it is impossible to construct a night lamp or watch light in oil, which is not liable to it.

After attempting various means to remedy this imperfection, the idea suggested itself of giving to the wick hole of my new lamp a small projecting edge, to enable it to throw off sideways the current of air ascending in the lamp tube, and compel it when returning to fall on the flame obliquely at a certain height above the extremity of the wick hole, or to speak more precisely, above the rising of the edge.

This edge which is in the form of a funnel, is not more than a line in breadth, and answers its object so completely, that the wick may be lowered to any desired point, without the least unpleasant smell. The flame, whether large or small, always continues at a sensible distance above the extremity of the wick hole, and the latter is never sufficiently heated to evaporate the oil which moistens it.

I need not expatiate on the comfort and pleasure of pos-

sessing a lamp, which may be made to burn with as small a flame as is desired, and that without any smell. In this way it may be used as a rush light, and in case of necessity, a light equal to that of one and indeed two candles, may be obtained in an instant.

The quantity of light furnished by this lamp, depends on the kind of wick which is used. I have tried several kinds, and the one that appears to me best calculated for common purposes, is a flat wick, about an inch or thirteen lines in breadth and a line thick. It necessarily takes the form of a tube, a little open at one side when entering the wick hole, and it may be given this form at first, as it will favour its easy introduction. This may be done when it is dipped in warm melted tallow, it is afterwards rounded at the moment of use, on a small stick of wood or metal, of about two lines in diameter.

To facilitate an operation which is always disagreeable and filthy, that of renewing a wick, I have adopted an invention already known, which appears to me very ingenious; it was proposed to me by M. Hadrot, tinman,* a very ingenious mechanic, who I have employed to manufacture my portable lamps. It is as follows, a straight round piece of strong brass wire, a line and an half in diameter, and three or four inches long, is attached firmly at its inferior part, to the lower extremity of the racket, and rests on the axis of the supporter of the lamp; the upper part entering by a collar of copper across the flat bottom of the wick pipe, has, at its superior extremity, a small lever, composed of three elastic hooks, of a minute size: they are of such a form, that when by means of the racket, the piece of wire is made to ascend sufficiently to permit them to pass out through the opening of the wick at its superior extremity, they will seperate spontaneously and seize hold of the remains of the old wick and retain it by its extremity

* Rue St. Sauveur, No. 43.

firmly locked in their teeth, so long as they are compressed in the wick pipe.

It must be apparent from this description, that it is only necessary to place the end of the new wick in the situation of the old one, and then cause the lever to return by means of the racket, into this wick pipe. This completes the operation, for the hooks being obliged to approach one another in order to re-enter the wick pipe, will seize firmly on the wick and draw it down with them.

The utility of this invention must be evident, since in addition to the above advantages, it permits us to extinguish the lamp so as not to cause any disagreeable smell.

I have observed that among the various kinds of wicks, I preferred a flat one for common use, but it is also necessary to mention, that this is not the kind calculated to burn with the most brilliant flame. To those who desire perfection in a lamp, and are regardless of the expense, I recommend a wick composed of three small twists of cotton, well rounded and two lines in diameter. They should be made stiff and hard by dipping them in melted wax and then tied at the bottom, and made to pass together into the wick pipe.

The air being confined and directed by the lamp glass, diffuses itself among these lighted strings and nourishes the flame, so as to give it an admirable whiteness and brilliancy. Any smoke may be prevented by raising the wick. I can truly say, that I never witnessed a more brilliant flame than that produced by a lamp adjusted in this manner, provided the lamp glass has been properly proportioned to the wick hole.

Another kind of wick may also be used, composed of two flat ones, attached together and placed in a peculiar wick hole, so as to form a cross at right angles. This variety furnishes a very brilliant light in large quantity, and on the whole is probably the best. It is well fitted for an occasional watch light, since in cutting its four parts which

remain flat, and touch in the centre, in a slope form, it will cause the flame to retire towards the axis of the wick-pipe whenever the wick is lowered. The consequence is, that the wick-hole is less exposed to be heated by the flame.

To render the flame very brilliant, it is necessary that the lamp glass should be six inches high, and at least eight or nine lines in its internal diameter. The lower part where it is enlarged should be from fourteen to sixteen lines both in diameter and height. The higher the tube, the less will the flame be disturbed, and indeed will become so steady, if it be high and strait, that the lamp may be exposed without apprehension to the highest wind. The current of air nourishing the flame, is so well established that nothing can derange it, and the lamp may even be considerably inclined without the flame leaving the axis of its tube, or blackening the sides of the glass.

If a small covering of thin sheet iron be placed on the top of the glass, the lamp will be so completely sheltered from wind and rain, that it may be used as a lantern.

The height of the lamp may be varied according to its use. As a substitute for wax candles, or the anti-chamber lamp, it should not exceed seven or eight inches. As a table lamp, the height of the supporter may be increased to ten or eleven inches, and this will neither alter its properties or its price.*

Before concluding this memoir, I will take the liberty of adding a few observations on the advantages resulting from the making of matches for lamps in the mode that I have proposed. My ideas may be explained in a few words.

To make a lamp burn well, it is necessary that the oil feeding it, should flow freely on the surface of the small

* The lamp varnished green or the colour of bronze, together with several gildings, costs twelve francs. With its small gauze screen and shade, varnished white within, it costs fifteen francs. If varnished completely white and richly gilded, the price is seventeen francs.

threads of cotton which form the wick, and every foreign substance, whether solid or fluid, which adheres to their fibres must necessarily prevent it.

There is a considerable quantity of air which remains attached to the cotton after it has been dipped in the oil.—This may be easily proved by placing the oil and wick *in vacuo*. There is also some moisture adhering to the wick, and the air and water are equally injurious in preventing the oil from flowing freely.

If melted tallow be heated to a temperature considerably above that of boiling water, and into this boiling liquid a wick or wicks of cotton be thrown, the air and moisture will be expelled with considerable hissing, and the cotton by occupying their situation, will totally exclude them.—The wicks are scarcely soaked before the hissing ceases, and they may be left to dry and harden gradually. They are afterwards to be wrapped in paper to preserve them from dust. In this way they may be kept for years, and I have indeed burnt some that were made ten years since. The utility of making candle wicks in a similar manner must be evident.

Acquainted from experience with the utility of this process, I am bold to recommend them, but I should observe at the same time, that great precaution is necessary in heating the tallow. This substance when near the boiling point, is very apt to take fire and burns with great obstinacy. To guard against this accident, it is necessary to heat the tallow in the open air. It ought to be placed in a large pan on a chaffing dish containing coals, since they burn without flame.

The wicks may also be prepared by dipping them into melted wax, heated near the boiling point. They do not however burn better than those prepared with tallow.

It is proper that the wicks, previous to the above operation, should be well washed and dried, since dust and every kind of filth are injurious.

I may further observe that these prepared wicks burn more equally and last longer than others, and are also less disposed to charr. The cause of difference is apparent.

If it be correct that oils purified with the sulphuric acid, retain a certain portion, notwithstanding the care to remove it, and if this acid seizes gradually on the wick and at last destroys it, when left for a considerable time in the oil,* certainly the preparation of wicks in a mode I have described, will be an infallible preventive against this danger, since until the wick is lighted, the oil in which it is immersed, cannot penetrate it.

I have now the honor to present to the class, fourteen lamps, all differing in construction, which were made in the course of my experiments. A detailed account of each would be tiresome. By examining them, the object which I had in view in their construction will be evident. One has a reverberatory machine, of white porcelain, made at Munich about twenty years ago.

One object has particularly engaged my attention, that of ascertaining a mode by which the flame of the lamp may be regulated, without raising or depressing its wick. A tube about an inch long, in which the wick pipe is tightly inserted, and by which it is made to ascend or descend at pleasure, has answered my views. When the lamp is trimmed and prepared, the tube, which serves as a regulator, is made to descend until its upper extremity is on a level with the aperture of the wick pipe. The wick is then raised by a forceps and snuffed, taking care than rather more be left than is necessary for its burning with the most brilliant flame it can afford. The regulator is afterwards raised a little, and when the lamp is lighted, is adjusted to the height found necessary to afford the desired quantity of light. The higher it is raised, the smaller will be the flame, and *vice versa*. In order to extinguish the lamp,

* This is asserted by many lamp makers in Paris.

the regulator must be raised to such a height as entirely to conceal the wick.

I have used this invention with the greatest success in adjusting the flame of lamps with spirits of wine, when used as chaffing dishes : It may be seen on the lamp which I have the honour to place before the class, but in oil lamps it will not prevent the unpleasant smell when they are extinguished. This is a defect common to all kinds of lamps, and will probably hinder the invention from being generally adopted, especially in low priced lamps.

It will be observed, that my lamps, however differing in the shape of their wicks, are all constructed so as to receive lamp-glasses. It is truly astonishing that this useful invention has not been long since universally adopted. It is now more than twenty years ago, since I have used it to enliven and brighten the flame of lamps with twisted, rounded or flat wicks. The flat wick may be perfectly enlivened without flattening its lamp-glass. But I must not at this time anticipate a subject, which I purpose examining in detail on some future occasion.

SUPPLEMENT.

Since this memoir has been presented to the Institute, I have instituted several experiments to ascertain what form of wick is best for the portable lamp, and after several trials, have found that a flat one, moulded in the form of a gutter, on a cylindrical stick, is decidedly preferable to the cylindrical wick, recommended in the memoir, and which is as certainly preferable to any in former use.

When this wick (properly rounded) is inserted into the wick-pipe, it ought to be presented to the forceps in such a manner that its open side be turned towards the handle

of the lamp. To fix it in this position, the wick-pipe ought to be flattened on that side, in the manner of a horizontal section, and thus instead of being circular, it will assume the shape of the letter D.

In making this alteration, the small border at the extremity of the wick-pipe may be omitted on the flattened part, but it ought to be retained in the remaining extent. I have ascertained that the very remarkable beauty of the flame of this lamp depends essentially on its preservation, and its omission renders the flame less brilliant.

The cause of this difference is easily explained, and will suggest an easy mode by which lamps may be highly improved, that of a *double current of air*.

In comparing my portable lamp with its wick open at one side, with a very beautiful and large lamp, which had a current of air; I found that the flame of mine was the whitest and handsomest, and several persons present were of the same opinion. Measuring with a photometer, the quantities of light furnished by each at their greatest brilliancy, that of the portable lamp was found equal to the light of four candles, of nine and an half lines in diameter, and that of the other equal to that of seven.

During this experiment, the portable lamp consumed eighteen grammes* of purified oil (of Colza,) in the hour, and the one with a double current of air, double that quantity.

When the portable lamp was furnished with a wick in the form of a closed cylinder, it gave no more light than the light of two candles, and notwithstanding consumed thirteen and an half grammes of oil during the hour. The following experiment however is still more extraordinary and appears to me highly interesting.

Having given to the wick-pipe of the lamp with a double current of air, a small conical border about two lines broad,

* A little more than half an ounce.

I observed that the flame was singularly changed. It appeared larger, whiter and more brilliant. The vast importance of these results will be readily perceived. I feel great pleasure in communicating them to the public, and only desire that every individual will content himself with profiting by them, without depriving others of the same liberty.

It will be readily perceived that this cylinder formed wick, open at one side, may be used with advantage in lamps of all sizes. The quantity of oil consumed, as well as of light diffused, will always be in proportion to the diameter of the wick-pipe. A portable lamp, for example, having one nine lines in diameter, and a wick sixteen lines in breadth, will diffuse as much light as an Argand's lamp of the largest size. But for domestic use, one that is able to afford the light of four candles, will be sufficiently powerful, and when this quantity of light can be diminished at will by lowering the wick, without loss of oil and without smoke or odour, and in addition to all this the whiteness of the flame not affected; it appears to me that every thing to be desired in the constitution of a lamp has been attained.

NOTE.

The following are the dimensions of the most essential parts of an extremely well finished portable lamp, now in my possession. Diameter of the lamp-supporter, sixteen lines. Height, eight inches four lines. Greatest diameter of the circular reservoir at its lower part, two inches eight lines. Length of the handle, five inches, depth of the handle nine lines. The handle and reservoir contain 116 grammes of oil (3.86 ounces). Depth to which the lamp glass is fastened on the supporter, fourteen lines.

Diameter of the wick-pipe within, five lines; diameter of its conical border, seven and an half lines; breadth of that part of its border which is raised, five lines; breadth of the wick, one and an half line; thickness after being prepared in melted tallow, one line; lateral opening of the wick when in its place, three and an half lines.

Dimensions of the lamp glass. Diameter below the superior cylindrical part, nine and an half lines; diameter at the top, eleven lines; height of the superior cylindrical part, five inches and three lines; total height, six inches and eight lines; interior diameter below, fourteen lines; height of the inferior cylindrical part, sixteen lines.

This lamp burning with all its brilliancy, and giving the light of four candles, will last for four hours and a half, with its complement of oil. When it diffuses no more than the light of two candles, it will burn for twelve hours, and so on in similar proportion.

APPENDIX.

Proceedings of the Legislature of the State of New-York and the Society for the Promotion of Useful Arts, for the Encouragement of the Manufacture of Woollen Cloth.

IN compliance with a representation from the Society, the Legislature at their session in 1807–8, passed the following law:

An act to Encourage the Manufacturing of Woollen Cloth within this State.

Passed April 8, 1808.

WHEREAS the public interest will be essentially promoted by the manufacturing of woollen cloth within this state: Therefore, for the encouragement thereof,

I. *BE it enacted by the People of the State of New-York, represented in Senate and Assembly*, That the person who shall produce, on or before the third Tuesday of February next, the best specimen of woollen cloth, of uniform texture and quality, not less than two hundred yards, manufactured in this state, of a breadth not less than three quarters of a yard, shall be entitled to receive a premium of one hundred and fifty dollars; that the person who shall produce the next best specimen of woollen cloth, of uniform texture and quality, manufactured in this state, not less than one hundred and fifty yards, and three quarters of a yard in breadth, shall be entitled to receive a premium of seventy-five dollars; and that the person who shall produce the next best specimen of woollen cloth, of uniform texture and quality, manufactured in this state, of at least

one hundred yards, and three quarters of a yard in breadth, shall be entitled to receive a premium of fifty dollars; that such cloth shall, for the purpose aforesaid, be produced to the Society for the Promotion of Useful Arts, at the city of Albany, at any of their weekly meetings during the session of the legislature, before the said third Tuesday of February next.

II. *And be it further enacted*, That the person who shall, in his family, manufacture within any of the counties of this state, the best specimen of woollen cloth, of uniform texture and quality, not less than thirty yards, the breadth not less than three quarters of a yard, shall be entitled to a premium of eighty dollars, to be determined by a majority of the judges of the court of common pleas of such county, on or before the last Tuesday in January next, who shall thereupon give duplicate certificates of such determination, one whereof to be sent with a specimen of the cloth adjudged to be the best, not less than one quarter of a yard, to one of the secretaries of the said Society for the Promotion of Useful Arts, before the second Tuesday of February next, and the other to the comptroller.

III. *And be it further enacted*, That the said Society for the Promotion of Useful Arts, shall, on the second Wednesday of March next, by a plurality of voices, determine on the several specimens sent from the several counties aforesaid, and shall determine on the first, second and third best specimens of such country domestic manufactured woollen cloth; and shall adjudge to the first quality one hundred and fifty dollars, to the second one hundred dollars, and to the third fifty dollars, each in a piece of plate, with such appropriate inscriptions as to designate the objects for which they were respectively premiums.

IV. *And be it further enacted*, That the said Society for the Promotion of Useful Arts shall prescribe the mode of ascertaining that the cloth was manufactured in this state, in such manner as they shall deem proper to guard against impositions.

V. *And be it further enacted*, That the comptroller, upon the production of the certificates of the president, or either of the vice-presidents of the said Society of Useful Arts, or of the judges aforesaid, in the cases referred to the said society and the judges respectively, of such determinations, adjudging the premiums aforesaid, shall issue his warrant for the payment of the said premiums to the persons who shall respectively be adjudged to be entitled to the same.

VI. *And be it further enacted*, That the said premiums be continued and adjudged and paid annually, as aforesaid, for the term of three years successively.

Pursuant to the provisions of the above act, premiums for the year 1809, were adjudged by the judges of the respective county courts, to the following persons, viz.

Names.	Counties.	Premiums.
1. John A. Slingerland,	Albany,	$80
2. Joseph A. Carpenter,	Allegany,	80
3. Thaddeus Thompson,	Broome,	80
4. Joel Coe,	Cayuga,	80
5. George King,	Chenango,	80
6. Benjamin Mooers,	Clinton,	80
7. George Booth,	Dutchess,	80
8. William Sturges,	Greene,	80
9. Charles Ward,	Herkimer,	80
10. Hart Massey,	Jefferson,	80
11. Lewis Graves,	Lewis,	80
12. Erastus Cleveland,	Madison,	80
13. Nathaniel Wolverton,	Montgomery,	80
14. John Ellis,	Onondaga,	80
15. Moses Crawford,	Orange,	80
16. Roswell Starr,	Otsego,	80
17. Alexander Milne,	Queens,	80
18. Joseph Dorr,	Rensselaer,	80
19. Samuel Bacon,	Saratoga,	80

Names.	Counties.	Premiums.
20. Walter Briggs,	Schoharie,	$80
21. Joshua Wickoff,	Seneca,	80
22. George Hornell,	Steuben,	80
23. Stephen Slosson,	St. Lawrence,	80
24. Miles Furman,	Tioga,	80
25. Christopher Snyder,	Ulster.	80

The Society for the Promotion of Useful Arts, in pursuance to the provisions of the above act, adjudged premiums on the 8th of March 1809, in manner following, viz.

To George Booth, for the best specimen of woollen cloth, of uniform texture and quality, not less than two hundred yards, nor less than three quarters of a yard in breadth, manufactured within this state, a premium of one hundred and fifty dollars.

To Samuel Bacon, of Ballston, in the county of Saratoga, for the best specimen of county family manufactured woollen cloth, a premium of $150, in a piece of plate.

To Christopher Snyder of Marbletown in the county of Ulster, for the second best specimen of county family manufactured woollen cloth, a premium of $100, in a piece of plate.

To George Booth, of Poughkeepsie, in the county of Dutchess, for the third best specimen of county family manufactured woollen cloth, a premium of $50, in a piece of plate.

JAMES LOW, *Recording Secretary.*

1810.

In pursuance to the provisions of the above recited act, premiums for the year 1810, were adjudged by the judges of the respective county courts, to the following persons, viz.

Names.	Counties.	Premiums.
1. John Gaddes,	Albany,	$80
2. Amos Patterson,	Broome,	80

Names.	Counties.	Premiums.
3. Joel Coe,	Cayuga,	$80
4. Sylvester Corbin,	Chenango,	80
5. Melancton L. Woolsey,	Clinton,	80
6. James Lambert,	Columbia,	80
7. John Miller,	Cortland,	80
8. Abner Peck,	Delaware,	80
9. George Booth,	Dutchess,	80
10. Peter Douw,	Essex,	80
11. Oliver Brewster,	Franklin,	80
12. James Thompson,	Greene,	80
13. Mary Wards,	Herkimer,	80
14. Noahdiah Hubbard,	Jefferson,	80
15. John Drew,	Kings,	80
16. Peleg Card,	Lewis,	80
17. Jonathan Olmstead,	Madison,	80
18. Thomas Hewet,	Montgomery,	80
19. Naman Goodwell,	Oneida,	80
20. John Ellis,	Onondaga,	80
21. Joseph Kellow,	Ontario,	80
22. Selah Strong,	Orange,	80
23. John Wyckoff,	Queens,	80
24. Wm B. Slocum,	Rensselaer,	80
25. John D. Coe,	Rockland,	80
26. Samuel Bacon,	Saratoga,	80
27. Simon I. Van Patten,	Schenectady,	80
28. Walter Briggs,	Schoharie,	80
29. Hains Bartlett,	Seneca,	80
30. Joseph Wood,	Suffolk,	80
31. Abner Turner,	Tioga,	80
32. Aaron Cleveland,	Washington.	80

The Society for the Promotion of Useful Arts, adjudged the following premiums on the 14th of March 1810.

To George Booth, for the best specimen of woollen cloth, of uniform texture and quality, not less than one hundred

yards, manufactured within this state, of a breadth not less than three quarters of a yard, a premium of 150 dollars.

To George Booth of the county of Dutchess, for the best specimen of county family manufactured woollen cloth, a premium of 150 dollars, in a piece of plate.

To Samuel Bacon of the county of Saratoga, for the second best specimen of county family manufactured woollen cloth, a premium of 100 dollars, in a piece of plate.

To James Thompson of the county of Greene, for the third best specimen of county family manufactured woollen cloth, a premium of 50 dollars, in a piece of plate.

JAMES LOW, *Recording Secretary.*

The Legislature at their session in 1810, passed the following act, by virtue of which the former was repealed.

An Act to Encourage the Manufacturing of Woollen Cloth within this State.

Passed April 5th, 1810.

WHEREAS important advantages, materially connected with the prosperity of this state, have resulted from the act to encourage the manufacturing of woollen cloth: *And whereas* it is found expedient to amend the said act, in order that the beneficial purposes contemplated thereby may be the better promoted: Therefore,

I. *BE it enacted by the People of the State of New-York, represented in Senate and Assembly,* That the person who shall produce to the Society for the Promotion of Useful Arts, at the city of Albany, at any of their weekly meetings during the session of the legislature, on or before the third Tuesday of February in each year hereafter, during the continuance of this act, the best specimen or specimens of woollen cloth, of uniform texture and quality as nearly as may be, not less than two hundred yards, wholly manufactured in this state and of wool produced in this state, of a breadth not less than three quarters of a yard, shall be

entitled to receive a premium of one hundred dollars; and that the person who shall produce in the manner aforesaid the next best specimen or specimens of woollen cloth, of uniform texture and quality as nearly as may be, manufactured as aforesaid, not less than one hundred and fifty yards, and three quarters of a yard in breadth, shall be entitled to receive a premium of fifty dollars; and that the person who shall produce in manner aforesaid the next best specimen or specimens of woollen cloth, of uniform texture and quality as nearly as may be, manufactured as aforesaid, at least one hundred yards, and three quarters of a yard in breadth, shall be entitled to receive a premium of thirty dollars.

II. *And be it further enacted*, That the person who shall, in his family or under his immediate direction, at his expense, manufacture or cause to be manufactured, within any of the counties of this state, of wool shorn from sheep owned in said county, the best specimen of woollen cloth, of uniform texture and quality, not less than thirty yards, the breadth not less than three fourths of a yard, shall be entitled to a premium of forty dollars; that the person who shall in his family manufacture or cause to be manufactured as aforesaid, within any of the counties of this state, the next best specimen of woollen cloth, of uniform texture and quality, not less than twenty-five yards, the breadth not less than three fourths of a yard, shall be entitled to a premium of thirty-five dollars; that the person who shall in his family manufacture or cause to be manufactured as aforesaid, the next best specimen of woollen cloth, of uniform texture and quality, not less than twenty yards, the breadth not less than three fourths of a yard, shall be entitled to a premium of thirty dollars; which specimens respectively shall be produced to the judges, or such of them as may attend, of the court of common pleas of the county in which the said specimens were carded, spun and wove, on the third Tuesday of January in each year, at such place where

the said court was last held, unless the judges of the said court shall otherwise direct: *Provided always*, That in case the said court shall sit in any of the counties on the said third Tuesday of January, then and in that case the specimens of such county shall be presented where the court is so held, and the said judges of the respective counties of this state or such of them as shall attend, shall on that or on the succeeding day examine and determine who are entitled to the said premiums; and in case that not more than two of the said judges shall attend on the said third Tuesday of January in each year, then the clerk of the county shall be associated with the said two judges in examining the said specimens, and determine who are entitled to the said premiums; that when two or more of the said judges shall attend, then the judges so attending shall make the examination and determination aforesaid, and in either case, previous to such determination, the said persons so attending are hereby authorised to determine as aforesaid, or a majority of them, shall require such reasonable proof that the several specimens so exhibited were actually carded, spun and wove in such county; and shall immediately after such determination, in each year, during the continuance of this act, make duplicate certificates of such determinations respectively, one whereof shall be securely attached to a piece, being at least one quarter of a yard, of each specimen of cloth adjudged to be the best as aforesaid, and sent to one of the secretaries of the Society for the Promotion of Useful Arts, before the third Tuesday of February in each year hereafter, during the continuance of this act, and the other to the comptroller; and the said clerks respectively are hereby directed at the time last aforesaid by writing to inform the secretary or vice-president of the said society, residing in the city of Albany, of the whole number of specimens of woollen cloth exhibited annually as aforesaid in their respective counties, together with the total number of yards so exhibited.

III. *And be it further enacted*, That any person may be a candidate for the state premiums for domestic or family manufactures, without being so for the county premiums: *Provided*, That instead of sending a specimen, such person shall send the whole piece of thirty yards, and not less than three fourths of a yard in breadth, to the Society for the Promotion of Useful Arts, accompanied with such proof as they shall deem satisfactory that the said cloth was manufactured in the manner directed by the second section of this act, within this state, from wool raised within the same.

IV. *And be it further enacted*, That no person shall be entitled in any one year to more than one of the premiums for cloth of domestic manufacture, to be adjudged by the judges of the courts of common pleas in the respective counties, and the judges of the said courts who shall attend for the purpose of performing the duties enjoined by this act, shall respectively receive two dollars for each days attendance, and the amount to be paid for such services shall be levied and collected in the same manner as the contingent charges of such county are by law directed to be levied and collected.

V. *And be it further enacted*, That the Society for the Promotion of Useful Arts, shall, on the second Wednesday of March in each year, by a plurality of voices, determine on the several specimens sent from the several counties aforesaid, on the first, second and third best specimens of such county domestic manufactured woollen cloth, and shall adjudge to the first quality, ninety dollars, to the second, eighty dollars, and to the third, seventy dollars, each in a piece of plate, with appropriate inscriptions to designate the object for which they were respectively premiums.

VI. *And be it further enacted*, That no person nor any company concerned or interested in any manufactory of woollen cloth, shall be entitled to any premium allowed by this act, for cloth of family manufacture, nor to more than one of the other premiums in any one year.

VII. *And be it further enacted*, That all cloth presented for premiums shall be of the same breadth as it was when manufactured, and not less than three quarters of a yard.

VIII. *And be it further enacted*, That the said Society for the Promotion of Useful Arts shall prescribe the mode of ascertaining that the cloth was manufactured within this state, in such manner as they shall deem proper to guard against impositions.

IX. *And be it further enacted*, That the comptroller, upon the production of the certificate of the president or either of the vice-presidents of the said society, or of the persons in each county authorised to give such certificates as aforesaid, in the cases referred to the said society and the said county officers respectively as aforesaid, of such determinations, adjudging the premiums aforesaid, shall issue his warrant for the payment of the said premiums to the persons who shall respectively be adjudged to be entitled to the same.

X. *And be it further enacted*, That this act shall continue in force for one year.

XI. *And be it further enacted*, That the act to encourage the manufacturing of woollen cloth within this state, passed the eighth day of April one thousand eight hundred and eight, be and is hereby repealed.

1811.

Pursuant to the provisions of the above act, the judges of the respective county courts adjudged premiums to the following persons, viz.

Names.	Counties.	Premiums.
1. Apollos Moore,	Albany,	$40
2. Henry Smith,	do.	35
3. Isaac Crary, jun.	do.	30

Names.	Counties.	Premiums.
4. Isaac Dyke,	Allegany,	$40
5. Nathaniel Dyke,	do.	35
6. Stephen Warkiman,	do.	30
7. Thaddeus Thomson,	Broome,	40
8. Amos Patterson,	do.	35
9. Samuel Rose,	do.	30
10. Joel Coe,	Cayuga,	40
11. Zenos Ward,	do.	35
12. Walter Bunnel,	do.	30
13. Joseph Collins,	Chenango,	40
14. Sylvester Corbin,	do.	35
15. James Willy,	do.	30
16. William Churchill,	Clinton,	40
17. Benjamin Mooers,	do.	35
18. Melancton L. Woolsey,	do.	30
19. Nathan Collins,	Columbia,	40
20. William Wilson	do.	35
21. Peter P. Teller,	do.	30
22. John Keep,	Cortland,	40
23. John Dodge,	do.	35
24. John Miller,	do.	30
25. Asa Emmons,	Delaware,	40
26. Frederick Uhl,	Dutchess,	40
27. Robert Wood,	do.	35
28. Brattle Butler,	Essex,	40
29. Roger A. Hand,	do.	35
30. Aaron North,	do.	30
31. Nathan Wood,	Franklin,	40
32. Oliver Brewster,	do.	35
33. Job Bateman,	do.	30
34. Betsey Town,	Genesee,	40
35. Thomas Seaman,	do.	35
36. David M'Cracken,	do.	30
37. James Thompson,	Greene,	40
38. Moses Austin,	do.	35
39. Daniel Cornwell,	do.	30

Names.	Counties.	Premiums.
40. Robert Burch,	Herkimer,	$40
41. Butler Halcomb,	do.	35
42. H. Neely,	do.	30
43. Daniel Ames,	Jefferson,	40
44. Noahdiah Hubbard,	do.	35
45. Adonijah Strong,	do.	30
46. Peleg Cana,	Lewis,	40
47. Chester Wood,	do.	35
48. Nathan Munger,	do.	30
49. William Sims,	Madison,	40
50. Orin Goodrich,	do.	35
51. Elisha Starr,	do.	30
52. Jesse Churchill,	Montgomery,	40
53. Amos Churchill,	do.	35
54. Roswell Churchill,	do.	30
55. Enoch Alden,	Oneida,	40
56. Samuel Boyce,	do.	35
57. Samuel Stillman,	do.	30
58. John Ellis,	Onondaga,	40
59. Zadock Hubbard,	do.	35
60. Comfort Tyler,	do.	30
61. Nathan Comstock,	Ontario,	40
62. Benedict Robinson,	do.	35
63. Samuel Casther,	do.	30
64. Alexander Thomson,	Orange,	40
65. Daniel Tobias,	do.	35
66. Abraham Vail,	do.	30
67. Agen Curtis,	Otsego,	40
68. Rufus Leonard,	do.	35
69. Stephen Carman,	Queens,	40
70. Aaden Allen,	do.	35
71. John Whitehall,	do.	30
72. William Rice,	Rensselaer,	40
73. William B. Slocum,	do.	35
74. Stephen Gaston,	do.	30

Names.	Counties.	Premiums.
75. John Coe,	Rockland,	$40
76. Jonas D. Secor,	do.	35
77. Dowe H. Talman,	do.	30
78. Salmon Child,	Saratoga,	40
79. Samuel Bacon,	do.	35
80. Seth Kirby,	do.	30
81. Mary Beordht,	Schenectady,	40
82. Walter Briggs,	Schoharie,	40
83. Abiel Lame,	do.	35
84. Abel Teater,	do.	30
85. James Bartlett,	Seneca,	40
86. James Van Horn,	do.	35
87. David Dey,	do.	30
88. Amos Bicknell,	St. Lawrence,	40
89. Richard Crasley,	Steuben,	40
90. Simon Wheeler,	do.	35
91. James Brundage,	do.	30
92. Joseph Woods,	Suffolk,	40
93. Elias Mulford,	do.	35
94. Samuel B. Miller,	do.	30
95. Jeremiah Gale,	Sullivan,	40
96. Abner Turner,	Tioga,	40
97. Thomas Floyd,	do.	35
98. Mills Forman,	do.	30
99. Simeon De Veer,	Ulster,	40
100. Christopher Snyder,	do.	35
101. David A. Hasbrouck,	do.	30
102. Lott Woodworth,	Washington,	40
103. Benjamin Illingworth,	Westchester,	40

The Society for the Promotion of Useful Arts, adjudged premiums on the 13th of March, 1811, in the following manner:

To George Booth, for the best specimen of woollen cloth, of uniform texture and quality, not less than two

hundred yards, manufactured within this state, and of a breadth not less than three quarters of a yard, a premium of 100 dollars.

To James Lambert, for the best specimen of woollen cloth, of uniform texture and quality, not less than one hundred and fifty yards, manufactured within this state, and of a breadth not less than three quarters of a yard, a premium of 50 dollars.

To Moses Austin, for the best specimen of woollen cloth, of uniform texture and quality, not less than one hundred yards, manufactured in this state, of a breadth not less than three quarters of a yard, a premium of 30 dollars.

To Frederick Uhl, of the county of Dutchess, for the best specimen of county family manufactured woollen cloth, a premium of 90 dollars, in a piece of plate.

To Joel Coe, of the county of Cayuga, for the second best specimen of county family manufactured woollen cloth, a premium of 80 dollars in a piece of plate.

To Jesse Churchill, of the county of Montgomery, for the third best specimen of county family manufactured woollen cloth, a premium of 70 dollars, in a piece of plate.

JAMES LOW, *Recording Secretary.*

The Legislature at their session in June 1812, passed the following act.

An Act for the Encouragement of Manufacturers of Woollen Cloth, and for other Purposes.

Passed June 19, 1812.

WHEREAS the rapid increase in the manufacture of woollen cloth within the state of New-York, and the great improvements in that branch of national industry, fully and satisfactorily evince that the bounties granted for that object have been highly useful, and that their continuance will be eminently beneficial: And it appears that an annual appropriation of a sum of money to be distributed in pre-

miums, by the Society for the Promotion of Useful Arts, would be calculated to aid the advancement of the said manufactures, and promote other objects of the first importance to the national respectability and prosperity, and highly conducive to the wealth and happiness of the community; Therefore,

I. *BE it enacted by the People of the State of New-York, represented in Senate and Assembly*, That the person who shall produce to the Society for the Promotion of Useful Arts, at the city of Albany, at any of their weekly meetings, during the session of the legislature, on or before the third Tuesday of February, in each year hereafter, during the continuance of this act, the best specimen or specimens of woollen cloths, of uniform texture and quality, as nearly as may be, not less than one hundred yards, wholly manufactured in this state, and of wool produced in this state, not less than six quarters of a yard in breadth, exclusive of the list, shall be entitled to receive a premium of one hundred dollars; and that the person who shall produce, in the manner aforesaid, the next best specimen or specimens of woollen cloths, of uniform texture and quality, as nearly as may be, manufactured as aforesaid, not less than seventy-five yards, and not less than six quarters of a yard in breadth, exclusive of the list, shall be entitled to receive a premium of fifty dollars; and that the person who shall produce, in manner aforesaid, the next best specimen or specimens of woollen cloths, of uniform texture and quality, as nearly as may be, manufactured as aforesaid, at least fifty yards, not less than three quarters of a yard in breadth, exclusive of the list, shall be entitled to receive a premium of thirty dollars.

II. *And be it further enacted*, That the person who shall in his family, or under his immediate direction, at his expense, manufacture or cause to be manufactured, within any of the counties of this state, of wool shorn from sheep owned in said county, the best specimen of woollen cloth,

of uniform texture and quality, not less than thirty yards, the breadth not less than three fourths of a yards, shall be entitled to a premium of forty dollars; that the person who shall, in his family, manufacture or cause to be manufactured as aforesaid, within any of the counties of this state, the next best specimen of woollen cloth, of uniform texture and quality, not less than twenty-five yards, the breadth not less than three fourths of a yard, shall be entitled to a premium of thirty-five dollars; that the person who shall, in his family, manufacture or cause to be manufactured as aforesaid, the next best specimen of woollen cloth, of uniform texture and quality, not less than twenty yards, the breadth not less than three-fourths of a yard, shall be entitled to a preminm of thirty dollars; which specimens respectively shall be produced to the judges, or such of them as may attend, of the court of common pleas of the county in which the said specimens were carded, spun and wove, on the third Tuesday of January in each year, at such place where the said court was last held, unless the judges of the said court shall otherwise direct: *Provided always*, That in case the said court shall sit in any of the counties on the said third Tuesday of January, then and in that case the specimens of such county shall be presented where the court is so held; and the said judges of the respective counties of this state, or such of them as shall attend shall on that or the succeeding day, examine and determine who are entitled to the said premiums; and in case that no more than two of the said judges shall attend on the said third Tuesday of January in each year, then the clerk of the county shall be associated with the said two judges in examining the said specimens, and determine who are entitled to the said premiums; that when two or more of the said judges shall attend, then the judges so attending shall make the examination and determination aforesaid; and in either case, previous to such determination, the said persons so attending are hereby authorised to determine as aforesaid,

or a majority of them, shall require such reasonable proof that the several specimens so exhibited were actually carded, spun and wove in such county; and shall immediately after such determination in each year, during the continuance of this act, make duplicate certificates of such determinations respectively; one whereof shall be securely attached to a piece, being at least one quarter of a yard, of each specimen of cloth adjudged to be the best as aforesaid, and sent to one of the secretaries of the Society for the Promotion of Useful Arts, before the third Tuesday of February in each year hereafter, during the continuance of this act, and the other to the comptroller; and the said clerks respectively are hereby directed, at the time last aforesaid, by writing, to inform the secretary or vice-president of the said society, residing in the city of Albany, of the whole number of specimens of woollen cloth exhibited annually as aforesaid, in their respective counties, together with the total number of yards so exhibited.

III. *And be it further enacted*, That any person may be a candidate for the state premiums for domestic or family manufactures, without being so for the county premiums: *Provided*, That instead of sending a specimen, such person shall send the whole piece of thirty yards, and not less than three fourths of a yard in breadth, to the Society for the Promotion of Useful Arts, accompanied with such proof as they shall deem satisfactory, that the said cloth was manufactured in the manner directed by the second section of this act, within this state, from wool raised within the same.

IV. *And be it further enacted*, That no person shall be entitled, in any one year, to more than one of the premiums for cloth of domestic manufacture, to be adjudged by the judges of the court of common pleas in the respective counties; and the judges of the said courts who shall attend for the purpose of performing the duties enjoined by this act, shall respectively receive two dollars for each day's

attendance, and the amount to be paid for such services shall be levied and collected in the same manner as the contingent charges of such county are by law directed to be levied and collected.

V. *And be it further enacted*, That the Society for the Promotion of Useful Arts, shall, on the second Wednesday of March in each year, by a plurality of voices, determine on the several specimens sent from the several counties aforesaid, on the first, second and third best specimens of such county domestic manufactured woollen cloth; and shall adjudge to the first quality, ninety dollars; to the second, eighty dollars, and to the third, seventy dollars, each in a piece of plate, with appropriate inscriptions to designate the object for which they were respectively premiums.

VI. *And be it further enacted*, That no person, nor any company concerned or interested in any manufactory of woollen cloth, shall be entitled to any premium allowed by this act for cloth, of family manufacture, nor to more than one of the other premiums in any one year.

VII. *And be it further enacted*, That all cloth presented for premiums shall be of the same breadth as it was when manufactured, and not less than three quarters of a yard.

VIII. *And be it further enacted*, That the said Society for the Promotion of Useful Arts shall prescribe the mode of ascertaining that the cloth was manufactured within this state, in such manner as they shall deem proper to guard against impositions.

IX. *And be it further enacted*, That the comptroller, upon the production of the certificate of the president or either of the vice-precidents of the said society, or of the persons in each county authorised to give such certificate as aforesaid, in the cases referred to the said society, and the said county officers respectively as aforesaid of such determinations, adjudging the premiums aforesaid, shall issue his warrant for the payment of the said premiums to the persons who shall respectively be adjudged to be entitled to the same.

X. *And be it further enacted*, That this act shall continue in force for three years, and no longer.

XI. *And be it further enacted*, That in case several of the specimens of cloth presented to the said society for the premiums to be by them awarded, should be of equal quality in other respects, the premium shall be adjudged to that piece which shall be deemed to possess the superiority of colour and dye.

Pursuant to the provisions of the above law, the judges of the respective county courts adjudged premiums to the following persons, in the year

1813.

Names.	Counties.	Premiums.
1. P. Frisby,	Albany,	$40
2. A. Moore,	do.	35
3. J. B. Moore,	do.	30
4. S. Rogers,	Broome,	30
5. I. Dodge,	Cortland,	40
6. I. M. Hocke,	do.	35
7. A. Webster,	do.	30
8. A. Thomas,	Delaware,	40
9. A. Emmons,	do.	35
10. R. Bristor,	do.	30
11. F. Uhl,	Dutchess,	40
12. C. Lee,	Essex,	35
13. B. Vaughan,	do.	30
14. J. Thompson,	Greene,	40
15. A. Botsford,	do.	35
16. W. Sturges,	do.	30
17. A. Smith,	Herkimer,	40
18. S. Dexter,	do.	35
19. J. Ingham,	do.	30
20. D. R. Baxter,	Madison,	40
21. E. Roberts,	do.	35
22. E. Starr,	do.	30

Names.	Counties.	Premiums.
23. N. Parker,	Montgomery,	$40
24. A. Churchill, jun.	do.	35
25. S. Hamilton,	do.	30
26. B. Gross,	Ontario,	40
27. J. Clark,	do.	35
28. I. Nicoll,	Orange,	40
29.*	do.	35
30. R. Starr,	Otsego,	40
31. D. Hawks,	do.	35
32. E. Pringle,	do.	30
33. T. Youngs,	Queens,	40
34. J. Jones,	do.	35
35. J. Wyckoff,	do.	30
36. S. Newcomb,	Rensselaer,	40
37. J. Dorr,	do.	35
38. J. Rouse,	do.	30
39. Philip Ten Eyck,	Saratoga,	40
40. Samuel Bacon,	do.	35
41. Nicholas Smith,	do.	30
42. J. Young,	Schenectady,	40
43. S. Jewett,	do.	35
44. J. Carpenter,	do.	30
45. S. Warren,	Schoharie,	40
46. S. Lawrence,	do.	35
47. G. Tiffany,	do.	30
48. J. Van Horne,	Seneca,	35
49. S. Gates,	St. Lawrence,	40
50. D. A. Ogden,	do.	35
51. A. Stone,	Steuben,	40
52. L. Gayland,	do.	35
53. S. Baker,	do.	30
54. C. H. Haven,	Suffolk,	40
55. J. Speed,	Tioga,	40
56. L. Beers,	do.	35
57.*	do.	30

* Names of manufacturers lost.

Names.	Counties.	Premiums.
58. A. Bevier,	Ulster,	$40
59. A. T. E. De Witt,	do.	35
60. C. Bevier,	do.	30
61. A. M'Nish,	Washington,	40
62. A. Cleveland,	do.	35
63. W. Cook,	do.	30

The Society for the Promotion of Useful Arts, adjudged premiums, on the 24th of March, 1813, to the following persons, viz.

To Benjamin Peck, in behalf of the Milton Manufacturing Society, in the county of Saratoga, for the best specimen of woollen cloth, of uniform texture and quality, not less than one hundred yards, manufactured in this state, and of a breadth not less than six quarters of a yard, a premium of one hundred dollars.

To Moses Austin, of the county of Greene, for the best specimen of woollen cloth, of uniform texture and quality, manufactured in this state, not less than fifty yards, and of a breadth not less than three fourths of a yard, a premium of thirty dollars.

To Philip Ten Eyck, of the county of Saratoga, for the best specimen of county family manufactured woollen cloth, a premium of ninety dollars, in a piece or pieces of plate.

To Nicholas Smith, of the county of Saratoga, for the second best specimen of county family manufactured woollen cloth, a premium of eighty dollars, in a piece or pieces of plate.

To Samuel Bacon, of the county of Saratoga, for the third best specimen of county family manufactured woollen cloth, a premium of seventy dollars, in a piece or pieces of plate.

JAMES LOW, *Recording Secretary.*

1814.

The judges of the respective county courts adjudged

premiums, for the year 1814, to the following persons, viz.

Names.	Counties.	Premiums.
1. Peter Frisbie,	Albany,	$40
2. Apollos Moore,	do.	35
3. Samuel Fuller,	do.	30
4. Jethro Wood,	Cayuga,	40
5. Joel Coe,	do.	35
6. David Bennet,	do.	30
7. Ezekiel Lockwood,	Clinton,	30
8. John Miller,	Cortland,	40
9. John Keef,	do.	35
10. Alexander Webster,	do.	30
11. Abraham Ogden,	Delaware,	40
12. Archibald Bassett,	do.	35
13. Abraham Thomas,	do.	30
14. Frederick Uhl,	Dutchess,	40
15. Peter R. Livingston,	do.	35
16. William Jones,	do.	30
17. Malcolm M'Martin,	Essex,	40
18. Caleb P. Cole,	do.	30
19. Moses Austin,	Greene,	40
20. William Sturges,	do.	35
21. Perkins King,	do.	30
22. John Straight,	Herkimer,	40
23. Butler Holcomb,	do.	35
24. John Drew,	Kings,	40
25. Moses Waters,	Lewis,	40
26. Ethan Card,	do.	35
27. Lewis Card,	do.	30
28. Ebenezer Caulking,	Madison,	40
29. Samuel Stillman,	Oneida,	40
30. John Ellis,	Onondaga,	40
31. Ahasel Smith,	do.	35
32. Joseph Smith,	do.	30
33. Daniel Bronson,	Ontario,	40
34. Thomas C. Hance,	do.	35

Names.	Counties.	Premiums.
35. Nathaniel Sanburn,	Ontario,	$30
36. Gabriel N. Phillips,	Orange,	40
37. John Nicoll,	do.	35
38. Joseph Wood, jun.	do.	30
39. William Armitage,	Otsego,	40
40. Barnin Foot,	do.	35
41. Caleb Ingalls,	do.	30
42. Thomas Youngs,	Queens,	40
43. Joseph Onderdonk,	do.	35
44. Daniel Youngs,	do.	30
45. Robert S. Bostwick,	Rensselaer,	40
46. Simon Newcomb, jun.	do.	35
47. Joseph Parker,	do.	30
48. John Suffern,	Rockland,	40
49. John D. Coe,	do.	35
50. John Coe,	do.	30
51. Elias Benedict,	Saratoga,	40
52. Philip Ten Eyck,	do.	35
53. Ezra Starr,	do.	30
54. Britton Wilbur,	Schenectady,	40
55. James Young,	do.	35
56. Henry Shute,	do.	30
57. A. Croswell,	Schoharie,	40
58. John Bigelow,	do.	35
59. Silas Barnum,	do.	30
60. Jane Pelton,	Seneca,	40
61. Anne Hall,	do.	35
62. David Dey,	do.	30
63. Samuel Chipman,	St. Lawrence,	40
64. Joseph Freeman,	do.	35
65. Seth Gates,	do.	30
66. David Rose,	Suffolk,	40
67. John H. Jones,	do.	35
68. Anthony Hasbrouck,	Sullivan,	40
69. Josiah Depuy,	do.	35

Names.	Counties.	Premiums.
70. Joseph Carlisle,	Sullivan,	$30
71. William Cook,	Warren,	40
72. Nathan Goodman,	do.	35
73. Jacob Winter,	do.	30
74. Alexander M'Nish,	Washington,	40
75. Reuben Wheeler,	do.	35
76. Aaron Read,	Westchester,	40
77. Jonathan Ward,	do.	35

On the 30th of March, 1814, the Society for the Promotion of Useful Arts, in pursuance to the provisions of the act, entitled "An Act for the Encouragement of Manufactures of Woollen Cloth," passed June 19th, 1812, proceeded to determine the premiums therein mentioned for the several specimens or parcels of woollen cloth presented to them, according to law, and adjudged the same in manner following.

To James Lynch, Esq. of Rome, Oneida county, for the best specimen of woollen cloth, of uniform texture and quality, manufactured in this state, of a breadth not less than six quarters of a yard, and amounting to more than one hundred yards, a premium of one hundred dollars.

To Moses Austin, of Durham, Greene county, for the best specimen of woollen cloth, of uniform texture and quality, manufactured in this state, of a breadth not less than three fourths of a yard, and amounting to more than fifty yards, a premium of thirty dollars.

To Frederick Uhl, of the county of Dutchess, for the best specimen of county family manufactured woollen cloth, a premium of ninety dollars, in a piece or pieces of plate.

To Gabriel N. Phillips, of the county of Orange, for the second best specimen of county family manufactured woollen cloth, a premium of eighty dollars, in a piece or pieces of plate.

To Elias Benedict, of the county of Saratoga, for the

third best specimen of county family manufactured woollen cloth, a premium of seventy dollars, in a piece or pieces of plate.

T. ROMEYN BECK, *Recording Secretary.*

Each of the Pieces of Plate voted during the last six years by the Society, bear the following inscription.

STATE OF NEW-YORK,

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By the Society for the Promotion of Useful Arts,
This Premium is awarded to of the County of for the best (or as the case may be) specimen of Woollen Cloth, of family manufacture, exhibited the present year.

The recording secretary reports, that in obedience to the provisions of the act entitled "*An Act for the Encouragement of Manufactures of Woollen Cloth,*" passed June 19th, 1812, he has received returns from the clerks of the following counties, detailing the quantity of cloth exhibited for premiums before the respective judges of county courts, in January, 1814, viz.

1. Greene county, 7 specimens, amounting to		233 yards.
2. Oneida county, 1 specimen,	-	36
3. Onondaga county, 5 specimens,	-	147 1-4
4. Ontario county, 5 specimens,	-	149 1-2
5. Otsego county, 8 specimens,	-	246 1-2
6. Rensselaer county, 10 specimens,	-	273 1-4
7. Schoharie county, -	-	130
8. St. Lawrence county, 5 specimens,	-	155
9. Sullivan county, 5 specimens,	-	140
10. Ulster county, 12 specimens,	-	367
	Yards,	1877 1-2

All which is respectfully submitted.

T. ROMEYN BECK, *R. S.*

NOTE.

It will readily be observed that the returns do not comprize more than one third of the counties in which cloth was exhibited. As this duty is not enforced by penalties on the clerks, the neglect of it is easily explained.

By a resolution of the Society, samples of the various specimens of woollen cloth, which have received county premiums, are preserved in its archives. They are bound up in volumes, one for each year, and may be viewed at any time by the members.

Amount of Money distributed in Premiums by the State and the Society.

During the year	1809,	$2450
	1810,	3010
	1811,	4065
	1813,	2590
	1814,	3095
Total in five years,		$15,210

Taurino Cloth.

In Society, February 23d, 1814.

Mr. Shotwell, of New-York, exhibited before the Society, several specimens of cloth, called by him *Taurino*, composed of various proportions of hair from the tanneries and sheep's wool—the examination of which was referred to a committee consisting of Messrs. Genet, Low and Spafford.

March 2d, 1814.

The committee appointed to take into consideration certain specimens of cloth, exhibited to the Society for the Promotion of Useful Arts, &c. by Mr. Shotwell, and by him termed *Taurino*, beg leave to

REPORT:

That they have examined said specimens, amounting to four in number; that they find two of the samples exhibited to consist of one third common wool and two thirds hair, from the tanneries; one sample of one fourth common wool and three fourths hair; and one of one fifth common wool and four fifths hair—that they find the whole number of specimens extremely well manufactured, of equal quality and texture, well *dyed*, and apparently, very firm and strong.

The committee further report, that from documents accompanying the specimens, it is certain, that a cloth equal if not superior in elegance and durability, is manufactured from hair alone; and that it is a valuable substitute for felting in the paper manufacture.

The committee have satisfied themselves by experiment, that this cloth is not only lighter than that manufactured from wool, but that it has the property of resisting moisture to a much greater degree, and that therefore, it is much better calculated for great or over-coats: And further, that,

from actual trial, it forms an equally elegant, and much more durable carpeting than wool.

The committee feel a degree of pride in having to state, that this invention, which converts a hitherto useless refuse, into a useful and highly important branch of manufacture has originated in our own state; and we feel a degree of confidence, that a discovery of so much real practical importance, will meet with the patronage of the public generally; but particularly of the legislature.

E. C. GENET,
JAMES LOW,
HORATIO GATES SPAFFORD.

A true copy,

T. ROMEYN BECK, *Rec. Sec'ry.*

Fossil Coal.

In Society, February 23d, 1814.

Resolved, That this society deem it highly important to make researches for the discovery of Fossil Coal, and that a committee be appointed to endeavor to procure pecuniary aid for this purpose, and in concert with the donors, to appoint some suitable person or persons to make the requisite investigations.

Messrs. Brownell, Spafford, Rodgers, Low, Noyes and Bruce, were appointed a committee.

A true copy,

T. ROMEYN BECK, *Rec. Sec'ry.*

CIRCULAR.

GENTLEMEN,

"The Society for the Promotion of Useful Arts, &c." taking into consideration the great benefit that would result to the people of this state from the discovery of Fossil Coal in the vicinity of its navigable waters, appointed a committee to consider and report on the most practicable means of effecting so desirable an object.—This committee, after proper enquiry and deliberation, reported as their opinion, that, if sufficient funds could be procured for defraying the expense, the course most likely to be attended with success would be "to employ some person or persons skilled in mineralogy to survey the country in the vicinity of the navigable waters of the state, and if any district should be found, which, from its geological structure and formation, indicated the existence of coal, that suitable persons should be directed to make the necessary borings to ascertain the fact."

Two other expedients suggested themselves to the com-

mittee—The encouraging the desired discovery by proper premiums; and the exertions of private associations.—With respect to premiums, the committee considered them highly useful so far as they might indicate the estimation of the importance that would be attached to the discovery.—In almost any other view they considered them altogether unavailing. No person, it was supposed, who might be qualified to make the proper investigations, would undertake a business where the expense would be so great and certain, and the reward trifling and doubtful: especially when the mine itself (a far greater reward) might be the property of another.—The committee did not entertain any more sanguine expectations from the exertions of private companies. Such associations, it was considered, though they might be necessary in working mines to advantage, were but ill calculated to make discoveries. The self interest on which they are founded would hardly exert itself in making expensive researches where the chief benefit of the discovery would flow to the public and to the proprietors of the soil. In the opinion of the committee, the only alternative was to trust to chance for making a discovery so important, or to resort to disinterested liberality for defraying the expense necessarily attendant on making the proper researches for effecting it.

The report above referred to was unanimously accepted by the society, and in pursuance of it another committee was appointed "to endeavor to procure the requisite pecuniary aid, and, in concert with the donors, to employ some suitable persons to make the necessary investigations."

This committee have determined to direct their first attention to the districts of country in the vicinity of the Hudson; and to carry the object of their appointment into effect, they have thought it proper to apply in this instance for pecuniary assistance to the corporations of the cities and villages along its banks. The common council of the city of Albany have generously offered a reward of one thou-

sand dollars to any person who may effect this wished for discovery. It is trusted that they will so alter the destination of this sum as to devote it to the promotion of the method proposed by the Society for the Promotion of Useful Arts. Such a sum from this public spirited body, together with twice or thrice its amount from the corporation of the opulent city of New-York, and a moderate aid from the city of Hudson and the villages along the river, would be sufficient to defray the expense of a very thorough geological survey of the country and a sufficient number of borings to ascertain a fact no less important to the progress of manufactures than it is interesting to the economy of house-keeping.

The committee forbear to dilate on the benefits that would result to the cities and villages along the Hudson from the discovery of coal in the vicinity of its waters, as those benefits must be fully understood and duly appreciated by the honorable bodies to whom this communication is addressed.

By order of the committee,

T. C. BROWNELL, *Chairman.*

JAMES LOW, *Secretary.*

A LAW,

Organizing certain Classes or Committees in the Society for the Purposes therein specified.

Passed by the Society, Feb. 23, 1814.

I. *BE it Ordained by the Society for the Promotion of Useful Arts*, That the primary subjects for its consideration be arranged under the following classes, viz.

1st. *Agriculture*—which will include Domestic Œconomy, Husbandry in general, Horticulture and Botany, with all the implements and machinery used therein; also Grazing, the Dairy, the management of Domestic Animals and Plants, their diseases and cures, and the nature of Soils and Manures.

2d. *Chemistry*—which will particularly include Mineralogy, Metallurgy, Dying, Tanning, Brewing, Baking, Malting, Glass Making, Pottery, and all the Arts connected with the science of Chemistry.

3d. *Mechanic Arts*—comprising almost every species of Handicraft, relating either to the necessaries and conveniences, or the elegancies of life; also all those Arts and Sciences which depend on Mathematics for illustration, as Mechanics, Optics, Astronomy, Pneumatics, &c.

4th. *Fine Arts*—which will comprehend Painting in all its branches, Sculpture, Modelling, Engraving, Music, Architecture, &c.

II. *And be it further ordained*, That the society will on Wednesday the second of March next, proceed to the election of four permanent committees, to be severally styled, the *Agricultural Committee*, the *Chemical Committee*, the *Committee of Mechanic Arts*, and the *Committee of Fine Arts*, to whom respectively shall be committed all communications to the society relating to the subjects comprehended in their respective classes. And that it shall be the special duty of each committee from time to time, to make

communications and reports to the society, on the aforesaid subjects. And in case it shall at any time be judged expedient to increase the number of either of the said committees, such committee shall have the privilege of proposing the candidates to the society, who shall elect them in the ordinary way.

III. *And be it further ordained*, That each of the aforesaid committees or any of the members thereof acting under its direction, be and is hereby authorised to correspond with any person or persons residing in or out of the United States, on any of the subjects comprehended in the class to which such committee or member may belong. That all such correspondence shall, from time to time, be reported to the society, and be considered its property. That the necessary expenses thereof be defrayed out of the funds of the society; provided the expense arising from any correspondence held by any one of said committees shall not in any one year exceed the sum of twenty-five dollars.

IV. *And be it further ordained*, That in all cases where it shall be deemed expedient, the respective committees aforesaid, shall have the privilege of proposing corresponding members to the society, to be elected in the same manner as the members of the committee were elected, provided the persons so proposed shall not reside in the state of New-York.

A true copy,

T. ROMEYN BECK, *R. S.*

Members of the Agricultural Committee.

SIMEON DE WITT, *Chairman*,	Elected	March 2, 1814.
CHARLES WHITLOW,	do.	do.
GERRIT W. VAN SCHAICK,	do.	do.
EDMUND C. GENET,	do.	March 9, 1814.
GEORGE CLARKE,	do.	March 16, 1814.

Members of the Chemical Committee.

JAMES LOW, *Chairman*,	Elected March 2, 1814.	
THOMAS C. BROWNELL,	do.	do.
T. ROMEYN BECK,	do.	do.
VINAL LUCE,	do.	March 16, 1814.
JACOB GREEN,	do.	do.
ARCHIBALD BRUCE,	do.	do.
GEORGE GIBBS,	do.	do.
WILLIAM S. CARDELL,	do.	do.
JOSIAH NOYES,	do.	March 28, 1814.
JONATHAN EIGHTS,	do.	do.
PETER WENDELL,	do.	do.

Members of the Committee of Mechanic Arts.

JAMES RODGERS, *Chairman*,	Elected March 2, 1814.	
ISAAC HUTTON,	do.	do.
BENJAMIN PECK,	do.	do.

Members of the Committee of Fine Arts.

EZRA AMES, *Chairman*,	Elected March 2, 1814.	
PHILIP HOOKER,	do.	do.
TIMOTHY CLOWES,	do.	do.
LOUIS LEMET,	do.	March 9, 1814.

CIRCULAR.

"The Society for the Promotion of Useful Arts of the State of New-York, having observed that the science of mineralogy, which is so intimately connected with, and so eminently subservient to most of the arts, and which has been so extensively and successfully cultivated in most other countries, is almost entirely neglected in our state; have endeavored to do away that imputation, by passing a reso-

lution for collecting and preserving such specimens of earths and metallic ores, as our state may afford.

In order to carry this desirable object into effect, the Society for the Promotion of Useful Arts, invite the members of the society as well as the lovers of the science in every part of the state, to forward to the recording secretary at Albany, such specimens of earths, earthy fossils, and metalic ores, as they may severally meet with, and request them to accompany all such specimens with as particular an account of its natural (geological) situation as possible, and to forward with the specimens a portion of their *matrix*, or the stony or earthy substance in which they were imbedded.

The society intend to arrange and preserve these specimens in a proper cabinet for the inspection and use of its members, and those who may have contributed to it."

A true copy,

T. ROMEYN BECK, *R. S.*

Any minerals transmitted to either of the members of the chemical committee, to any of the members of the society resident in Albany, or to either of the corresponding secretaries, will receive due notice, and a particular account of its mineralogical character (if required) will be given. It is however to be understood, that at least two specimens of the same mineral must be forwarded, one for the cabinet, and the other for the experiments that may be deemed necessary to be made on it.

In Society, March 16, 1814.

Resolved, That the committee of Fine Arts, be requested to procure a copy of the best and most correct portrait of the late president of this society, ROBERT R. LIVINGSTON, and that the expenses thereof will be defrayed by the society.

A true copy,

T. ROMEYN BECK, *R. S.*

Alphabetical List of the Members of the Society for the Promotion of Useful Arts.

[Those marked with an Asterisk are deceased.]

Abraham Adriance,
Ezra Ames,
Joseph Annin,
Moses Austin,

John Ballard,
Samuel Bard,
T. Romeyn Beck,
Thomas Bicknell,
Harmanus Bleecker,
Francis Bloodgood,
Francis A. Bloodgood,
Joseph Bloodgood,
John G. Bogart,
John M. Bradford,
John Brainard,
Charles C. Brodhead,
Micah Brooks,
John Broome,*
William Broome,
Jacob Brown,
Thomas C. Brownell,
Archibald Bruce,
Salmon Buel,
George Bumford,

Archibald Campbell,
Seth Capron,
William S. Cardell,
Josiah Chapman,
James De Le Ray Chaumont,
Philip Church,
George Clarke,
De Witt Clinton,
Timothy Clowes,
James Cochran,
Walter L. Cochran,
Charles D. Cooper,

James Dean,
Peter De La Bigarre,*
Isaac Denniston,
Benjamin De Witt,
Simeon De Witt,
Frederick A. De Zeng,
Robert Dunbar,

Caspar W. Eddy,
Jonathan Eights,
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G. W. Featherstonhaugh,
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Douw Fonda,
Ebenezer Foot,
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John Lyon Gardner,
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David Hosack,
Ruggles Hubbard,
Jonas Humbert,
Isaac Hutton,
James Hyatt,

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James Kane,
James Kent,
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Benjamin Knower,

Louis Lemet,
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Ezra L'Hommedieu,*

John Lincklaen,
Edward P. Livingston,
Robert R. Livingston,*
William Livingston,*
James Low,
John Low,
Vinal Luce,
James Lynch,

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Levi M'Kean,
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John B. Romeyn,
Erastus Root,
William Ross,
John Russell,
Samuel Russell,

Benjamin Sandford,
Philip Schuyler,
Rensselaer Schuyler,
John V. D. S. Scott,
Theodore Sedgwick,
Alexander Sheldon,
Nathan Smith,
Peter Smith,
Solomon Southwick,
H. G. Spafford,
John Stearns,
John Stevens,
James Stevenson,
Selah Strong,
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Stephen Van Rensselaer,
Anthony Van Schaick,
G. W. Van Schaick,
Herman Vosburgh,
William W. Vredenbergh,

Elkanah Watson,
George Webster,
Peter Wendell,
Rensselaer Westerlo,
Charles Whitlow,
James W. Wilkin,
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John Woodworth,

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Joseph C. Yates,
Peter W. Yates,
John Young.

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